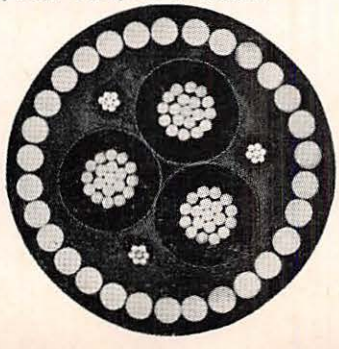
JANUARY, 1968

Railway Signaling & Communications

on guard

This is a nest of grouse eggs. A nest is a fragile concatenation of twigs, built by a delicate creature with no hands, but it is built to do a job, and it does that job to perfection. Within one classic circle, a nest is a home, a bed, and a protective shelter.

Below is a "plan" of a Kerite cable. Cables may look alike in cross-section, but a Kerite cable is as different from other cables as a nest is from random twigs. Kerite is built to do its job to perfection. Only the right combination of proved materials, engineering, experience, and technique makes it possible. The Kerite Company, 30 Church Street, New York, N. Y. 10007.



Kerite

the cable that lasts...and lasts...and lasts...

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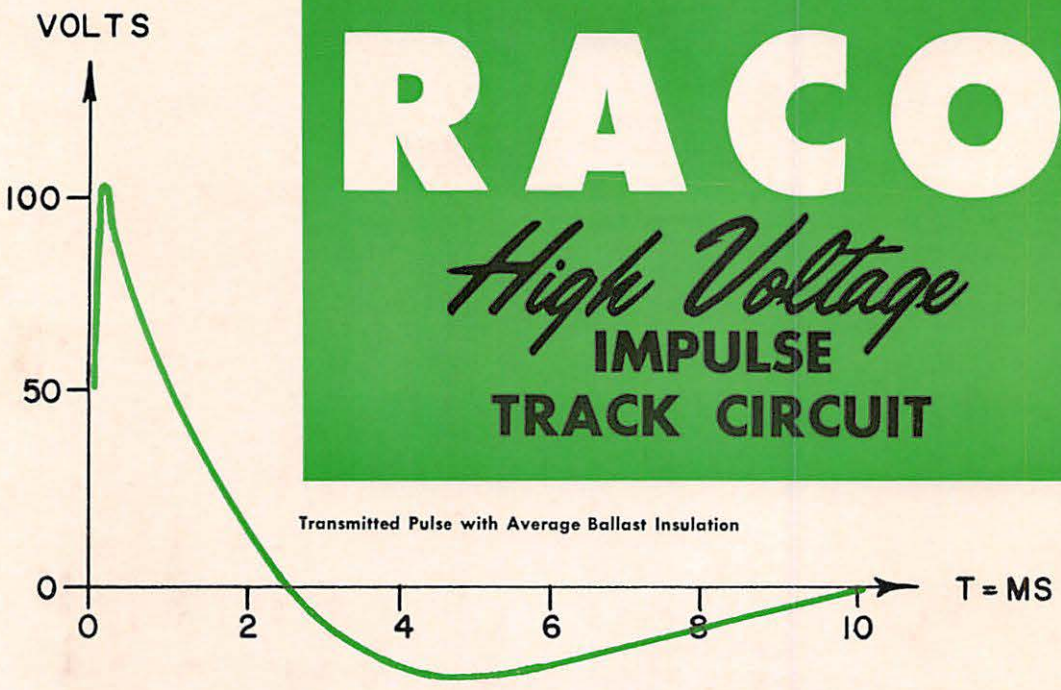

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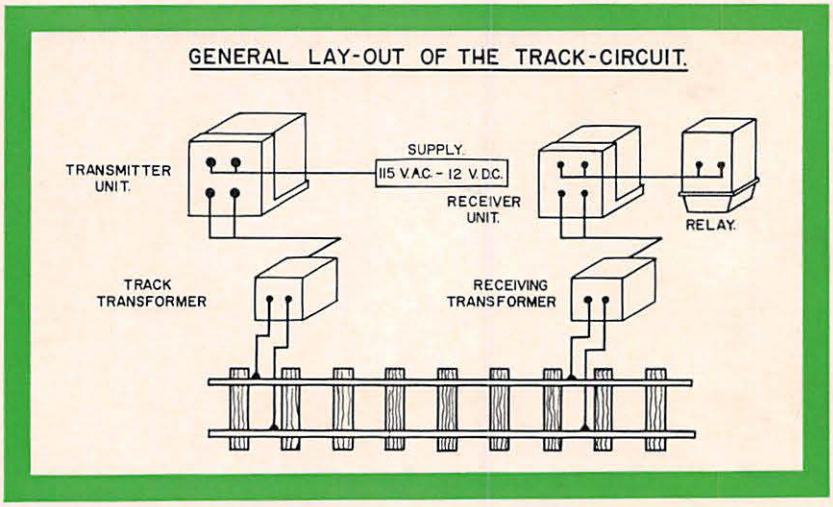

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Circle 1 on reader service card

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from the people in the know about railroad communications

A Motorswitch 4-Wire Switching System that switches voice and data on a no-loss basis between PBX trunk, carrier, microwave, or physical circuits. System design is based specifically on your special communication needs.

Unlimited in capacity, Stromberg-Carlson Motorswitch 4-Wire Switching features common control that provides universal numbering and alternate routing. Plus: route restriction, priority pre-emption service, multifrequency interoffice signaling, and other advantages.

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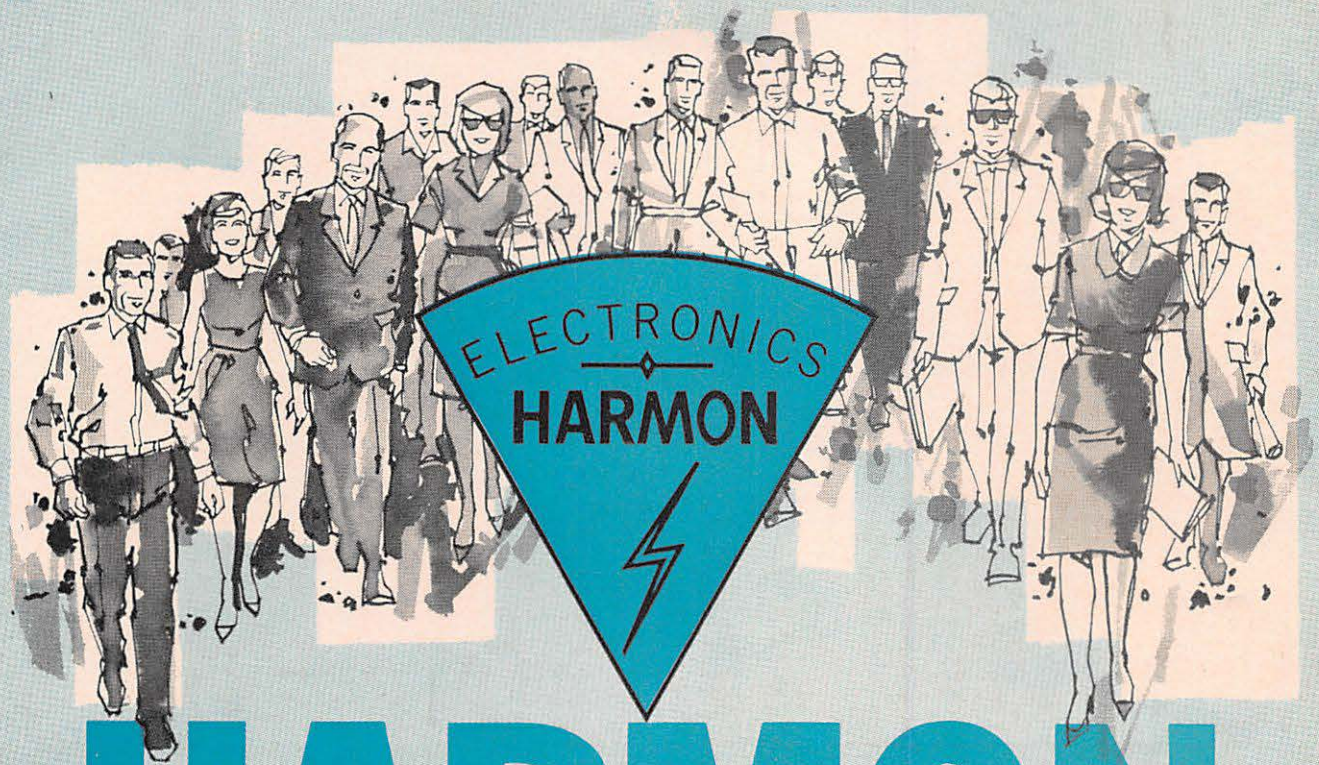

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Harmon Electronics, Inc.

Circle 5 on reader service card

January 1968
Vol. 61 No. 1

Railway Signaling & Communications

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EDITOR'S CORNER

Characters: Ancient & Modern

Satraps, pariahs, lords and serfs were well known and commonplace in ancient records. Recent experiences, however, indicate that while these personages are no longer referred to in these terms the meaning is still significant and their modern day counterparts are still around and easily identifiable by their methods of operation. Some, however, are well disguised.

Satraps are comparatively easy to recognize as their actions reveal their true identity. Pariahs and serfs are hidden from view by the satraps who claim all of the credit for the accomplishments of their subordinates.

But, if it were not for the efforts of the pariahs in signaling and communications, progress would seldom be made. That pariah, crying in the wilderness is scorned and ridiculed and too often just ignored.

Pyrrhic victories are sometimes won by the satraps and they are accordingly cheered, while the serfs who worked so hard to make them possible must be content with the fact that they were performing the job "they were being paid for," and the glory belongs to someone else.

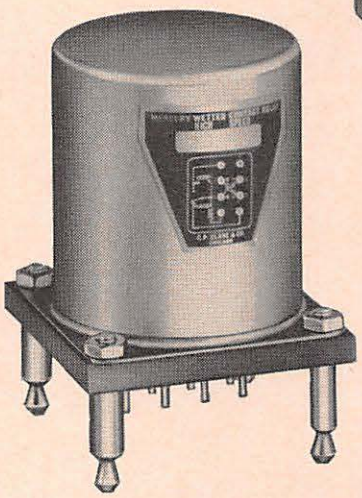
In our world of signaling and communications, the satrap always appears busy issuing ukases. However when that same satrap is with the Caesars or Pharaohs of the industry he is reduced to serfish utterances or at most, membership in the praetorian guard.

What this all boils down to is that instead of issuing orders it would be the satrap's, and everyone else's, benefit if he would emulate a benificient monarch. It would be to everyones' advantage if satraps, serfs and pariahs could communicate as equals and friends. Then all would speak, not for self-grandisement, but to gain knowledge and improve the technology for the benefit of all concerned.

Also, the satrap could benefit materially by listening. His knowledge would be increased and when confronted by higher officials he could present his case with confidence and strength.

Elsworth L. Abbott, Serf
Robert W. McKnight, Pariah

CLARE/Optimity in control



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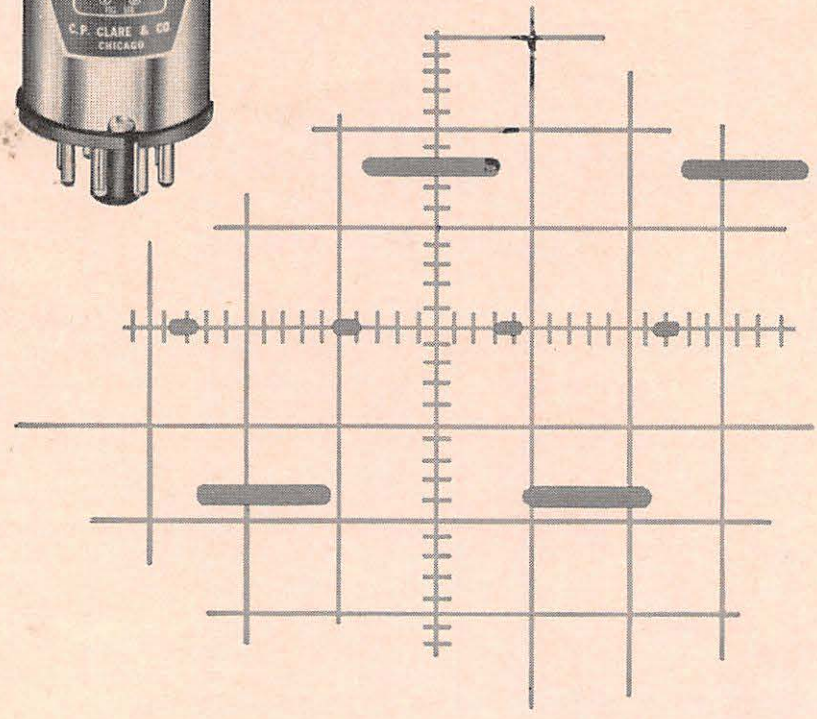
◀ Models for wired assemblies ▶



no bad orders,

over years of service—Clare Polar Relays provide over 22 billion operations without maintenance or adjustment!

Clare Mercury-Wetted Contact Polar Relays more than pay their way in maintenance savings... sealed-in-glass contacts end the cleaning and adjustment costs of standard polar relays. You gain better performance, too. Clare Polar Relays deliver clean-cut, sharp outputs all along the line . . . with minimal pulse distortion over billions of operations . . . at speeds to 180 baud (90 cps) with signal unbalance of 2% or less. Put new performance efficiency and savings to work... make unit-for-unit replacement in present telegraph/teleprinter circuits . . . specify wired assembly units, and exclusive Clare pcb modules for advanced communications and computer operations.

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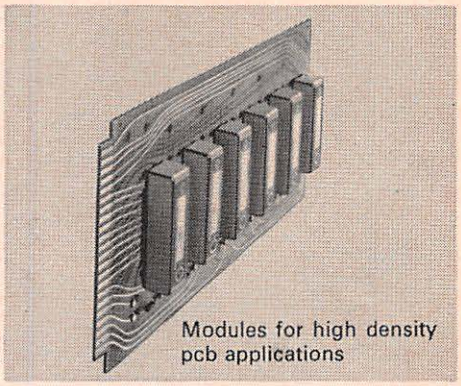
a GENERAL INSTRUMENT company



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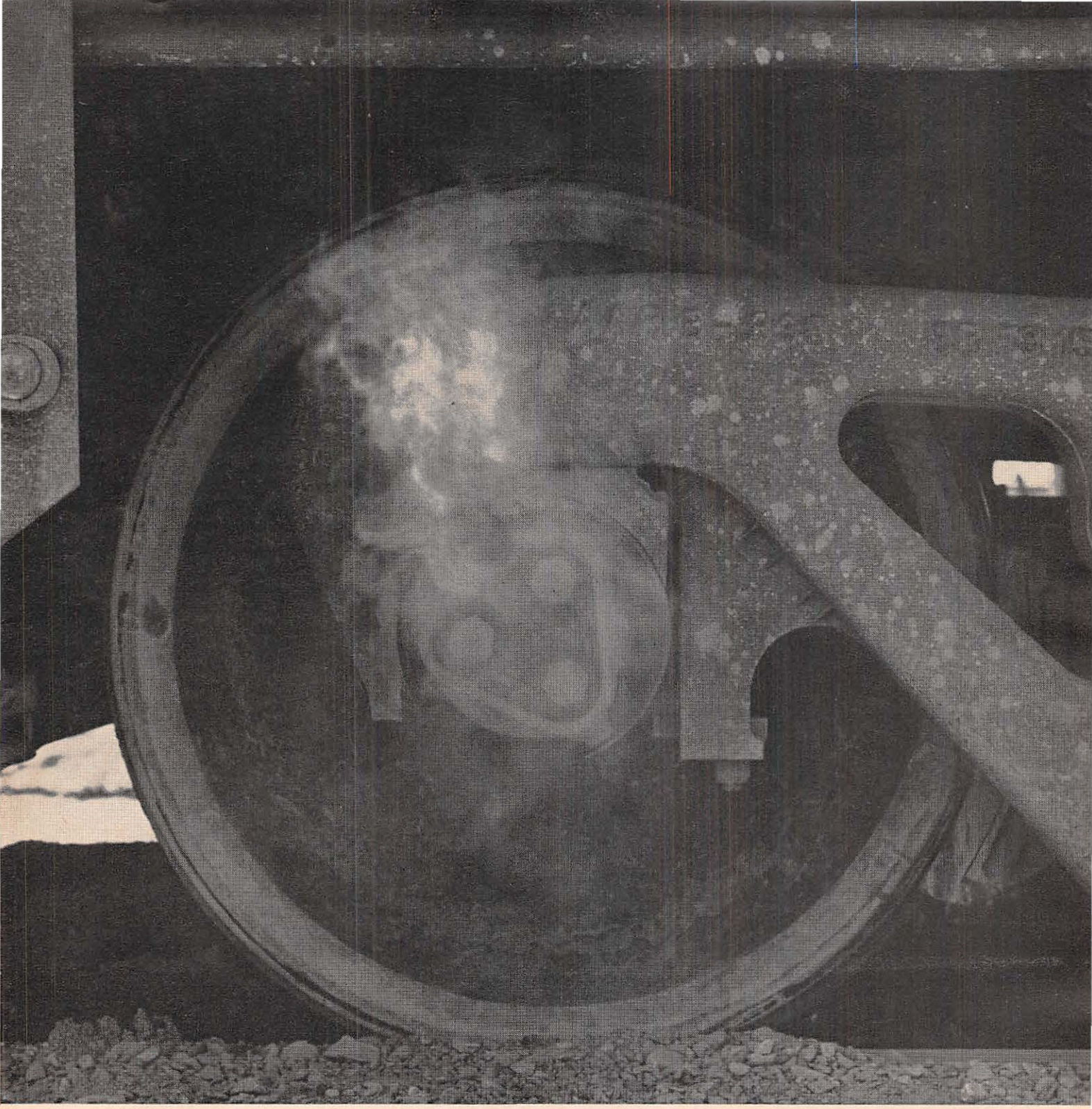

Out of the money.

Literally. It costs millions of dollars a year, plus the lost railroad tonnage cars can't carry. The culprits: hot boxes, disintegrated bearings, axle burn offs.

Solution: a hot box detection system, sensors, data transmission equipment, recorders. *We make the transmission equipment.* We call it the Lenkurt 960A. It accepts input from all detector units and transmits it to your recorders. Use the 960A with all transmission media from open wire to microwave radio, at any of 27 carrier frequencies. It maintains a constant high level of reliability over a long life and meets all AAR operational standards.

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GENERAL SYSTEM

Circle 7 on reader service card

The Unsnarler.

The Unsnarler! That's the Servomatic® Switching Area Crossing Control System. It's designed specifically for busy, low-speed industrial switching areas. Servomatic keeps highway traffic flowing—even at crossings in the busiest switching areas.

Operation is simple and effective. Crossing protection controls operate when a train approaches a crossing. In addition, when a train stops or moves away from the crossing, Servomatic terminates the warning devices and permits pedestrian and vehicular traffic flow. As the train re-approaches, crossing controls are re-activated—providing statutory warning time automatically. And there's no need for manual supervision.

If you're concerned about increased highway traffic and yard activities affecting the movement of your trains . . . investigate the Servomatic. Call us and get all the details on the unsnarler.

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Circle 8 on reader service card

Mister, can you spare $20.00 for a cup of water?

No joke. By the time maintenance crews make their appointed rounds, adding water to your communications batteries, you could be paying that much . . . or more.

The solution? Use C & D lead calcium batteries and make up to 12 times fewer maintenance calls.

How? By adding water only once every three years, for one thing. Compare this with 6 to 12 times each year for conventional antimony designs.

By eliminating equalizing charges, for another. C & D lead calcium batteries never need one if kept on the proper float charge. Antimony type batteries require a check charge at least 6 times a year to determine if an equalizing charge is necessary.

$20.00 is a lot of money for a cup of water; spare a few minutes and get the maintenance saving facts. Write C & D Batteries, Conshohocken, Pa. 19428.

C&D BATTERIES

DIVISION OF **ELTRA** CORPORATION

Washington & Cherry Streets, Conshohocken, Pa. 19428

Circle 9 on reader service card

Running trains on a computer ...another GRS capability

By simulating train operation on a computer, we can predict what would happen if you added trains, relocated sidings, regraded, etc.

This is typical of GRS capabilities. We offer far more than well designed hardware. We can place, at your service, in-depth knowledge and the benefits of well over 60 years of systems engineering experience.

GRS SYSTEMS

automatic block signaling
automatic train inspection
automatic train operation
cab signaling
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control centers
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hotbox detector
interlocking
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GRS HARDWARE

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switch roller bearings
train stops

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Terminals
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3438

Circle 10 on reader service card

The battery and ½

These tubes let you squeeze more life out of it.

The extra life in the Exide-Ironclad battery is packed into these fiberglass tubes. There are more than a dozen in every plate. They hold the active material and press it more firmly against the grid than any flat plate could. So charges are held longer, and the battery lives longer. They're one reason we call ours "the battery and ½."

Years of research went into this design. Many materials were rejected before this special braid was developed. It lets the acid work freely, yet grips the active material tightly.

To learn more, write: Industrial Group, ESB Incorporated, Box 5723, Philadelphia, Pa. 19120.

World leader in packaged power.

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Interlockings—1967

Railroad	No. of Plants	Switches	Signals
B&M	1	—	4h
CN	2	3+1el	15h, 3d
CP	1	3	4h, 4d
C&O/B&O	1	3+2el	5h
C&NW	2	2	4h
CMStP&P	1	1+1el	—
DT&I/AA	1	4	5h
EL	1	2+2el	4h, 1d
FEC	1	—	4h, 2d
IC	1	1+1el	3h, 3d
KCT	1	—	2d
L&N	2	6+3el	11h
NYC	13	11+3el	41h
NYCTA	8	50	73h, 55d
N&W	3	4	12h, 3d
PRR	34	56+12el	67h
Reading	3	11	2h, 1d
SCL	2	—	6h, 5d
SP	5	17+5el	37h
TH&B	1	—	4h
Totals	**84**	**174+30el**	**301h, 79d**

el = Electric locks
h = Home signals
d = Distant signals

ballot making it mandatory for all freight cars, trailers and containers used in interchange service to be equipped with the Sylvania KarTrak color-coded ACI labels by Jan. 1, 1970.

In addition to railroads having their own management information systems, the demands of ACI and TRAIN will mean, for many railroads, a tremendous increase in communications facilities. Preliminary figures show that about 3400 route miles of microwave systems will be started or under construction during the year. Several railroads are entering the microwave field for the first time, having reached the point of saturation of many of their wire line facilities.

Several railroads have indicated that they will install ACI scanners during 1968 and others have reported that studies are underway to determine locations of ACI scanners.

With the increased demand for communications, some railroads have shared microwave and leased voice channels. For example, sharing of Telpak services is quite common, particularly for providing circuits to off-line traffic offices. Also, Federal Communications Commissions rules allow railroads to share microwave facilities. A few railroads are now leasing voice channels from other roads having microwave systems. This practice will probably increase during the next few years. Railroads often find the practice of leasing circuits an advantage when an immediate need arises. Lease arrangements may have relatively short cancellation agreements, such as 60 or 90 days, enabling a railroad to realign its circuits as occasion warrants. Some roads may well find it an advantage to lease circuits to ACI scanners, particularly upon initial installation of scanners, and continue leasing until such time as it can engineer and install its own facilities. Where scanners are located at interchange points, it might be feasible and economical for one road to lease circuits to the ACI scanners from other roads at the interchange location.

Railroads have already indicated that they will purchase about 1,000

Signal Equipment—1967

	1967
Traffic control and block signal systems	
Track miles*	1,661.7
Controlled signals	943
Automatic signals	1,055
Power switches	473
Spring switches	4
Electric locks	277
Automatic train stops	743
Rolling stock with cab signals	214
Classification yards	
Retarders	26
Power switches	115
Highway crossings protected	
With flashers only	1,079
With flashers & gates	638
Interlockings	
Power switches	174
Home signals	301
Distant signals	79
Electric locks	30
Safety detectors	
Dragging equipment	70
Clearance (high load)	3
Hotbox	132
Presence	210
Loose wheel	31
Slide fence, feet*	116,700
Other Signal devices	359
Totals	6,956

*Excluded from totals

Communications Equipment—1967

	1967
Miles of new or rebuilt pole line*	2,152
Miles of new aluminum line wire*	2,606
Miles of new copper line wire*	1,653
Carrier equipment installed	
Terminals: Voice only	2,398
Speech plus telegraph	138
Telegraph only	2,572
Repeaters: Voice only	138
Speech plus telegraph	4
Telegraph only	155
Microwave stations	79
Printing telegraph equipment	
SR, RO and SR machines	2,500
Reperforators	270
Automatic telephone exchanges	61
Stations available	5,841
Radio	
Mobile	3,831
Road base stations	319
Yard base stations	105
Walkie-talkies	1,894
Yard loudspeaker systems	
Talk-back speakers	452
Paging speakers	311
Intercom systems	
Telephones	538
Loudspeakers	1,661
Totals	23,267

*Excluded from totals

radio sets during 1968, and this should reach the 3500-4,000 mark by the end of the year. A considerable replacement market is developing. Probably 1,000 transistorized sets will be purchased to each year to replace older vacuum-tube units. Many railroads reported that during 1968 they will completely equip their maintenance-of-way work equipment with two-way radio units.

Reports indicate that well over 500 buses are to be equipped with radio during 1968. Also, several transit authorities are equipping their rapid transit trains with radio to provide direct communication between dispatchers, police and train crews.

Radio for transit operations and other communications equipment used in transit will provide a $4.8 million market in 1968 for equipment manufacturers. Several transit authorities report that during the coming year they will equip stations with public address systems to provide direct communications from operating headquarters to the traveling public.

Yard Signaling—1967

Railroad	Location	Equipment
B&M	Mechanicville, N.Y.	1 retarder
CP	Coquitlam	1 retarder, 12 non-interlocked power switches
D&H	Hudson, Pa.	8 non-interlocked power switches
DT&I	Flat Rock, Mich.	6 retarders, 25 interlocked power switches
MP	Kansas City, Mo.	4 non-interlocked power switches
N&W	Bellevue, O.	24 non-interlocked power switches
PRR	Camden, N.J.	6 retarders, 31 non-interlocked power switches
SP	Beaumont, Tex.	12 retarders, 11 non-interlocked power switches
Totals		**26** retarders **115** power switches

Safety Detectors—1967

Railroad	Dragging Equipment	High-Wide Load	Hotbox	Presence	Loose wheel	Feet of Slide Fence
AT&F	—	—	9	—	—	—
B&LE	2	—	2	—	2	—
CN	13	1	19	—	—	—
CP	—	—	—	—	—	1,150
C&O	—	—	9	—	—	—
B&O	—	—	6	—	—	—
C&NW	—	—	10	—	—	—
CMStP&P	—	—	—	—	1	—
D&H	—	—	1	—	—	—
DT&I	—	—	—	26	—	—
EL	—	—	2	—	—	—
FEC	13	—	3	—	13	—
GN	—	—	—	—	—	1,000
GM&O	1	—	2	—	1	—
IC	—	—	3	—	—	—
L&N	—	—	3	—	—	—
MP	2	—	1	—	2	—
NYC	17	1	10	39	—	—
N&W	13	—	9	—	9	—
NP	—	—	4	37	—	—
PRR	—	—	—	68	—	1,000
Reading	—	—	2	—	—	—
StL-SF	—	—	—	40	—	—
SCL	4	—	2	—	—	—
SP	3	—	30	—	—	—
SP&S	—	—	—	—	—	51,150
UP	—	—	—	—	—	62,200
WM	2	1	2	—	3	—
WP	—	—	3	—	—	—
Totals	**70**	**3**	**132**	**210**	**31**	**116,700**

Crossing Protection—1967

Railroad	No. of Crossings Protected By Flashers	Flashers & Gates
Alaska	3	—
AC&HB	5	—
AT&SF	42	60
A&WP-WRyA	2	—
BAR	3	—
B&LE	—	1
B&M	4	2
CN	260	53
CP	148	21
CNJ	3	5
C&O	30	16
B&O	14	12
C&NW	34	11
C&WI	—	2
CB&Q	25	11
CGW	8	—
CMStP&P	31	11
CSS&SB	—	1
D&H	5	1
D&RGW	17	3
DT&I	1	2
AA	3	—
DM&IR	4	—
EJ&E	—	5
EL	6	3
FEC	10	9
GN	16	2
GB&W	3	—
GM&O	6	3
IC	34	4
L&HR	3	—
LV	3	1
LI	1	16
L&N	25	4
MEC	1	—
MKT	11	1
MP	22	4
NYC	26	30
N&W	19	13
NS	5	—
NP	14	4
ONL	3	—
PGE	6	—
PRR	15	14
P&PU	1	—
PATH	—	1
Reading	3	—
StL-SF	26	2
SCL	57	25
SP	69	250
SP&S	5	—
Tenn. Cent	4	—
TRAStL	—	1
TH&B	9	—
UP	25	23
WM	5	1
WP	4	10
Totals	**1,079**	**638**

The proposed expenditures for signaling and communications in 1968 indicate that plans are well advanced to fully utilize new systems and concepts such as ACI, TRAIN and management information systems. Also, the 1968 S&C spending plans should make suppliers happy. The only note of caution mentioned by S&C men is that if carloadings drop, significantly, then spending may be curtailed. However, there is a greater realization than ever (particularly by top management) that it takes time to plan for and implement these modern control systems—ACI, TRAIN, management information systems, automatic yards, etc.—so that once started it is often more costly to stop and restart then to continue the project to completion without interruption. Also, there is a target date for ACI and TRAIN to be operational in 1969 and 1970. Thus, the $84 million to be spent in 1968 for signaling and communications equipment by U.S. and Canadian railroads and transit authorities will be well spent.

1967 WAS GOOD

Units of signaling equipment installed during 1967 were the highest since 1960, totaling 6,981 units. Much of the increase was due to the greater emphasis on highway-railroad grade crossing safety. Flash-

Special Devices—1967

Railroad	Devices
A&S	1 spring switch & 1 signal
B&LE	1 closed circuit TV
B&M	1 holding signal, 1 train order signal, 1 departure test loop, 1 spring switch & 1 signal
CN	64 snow melters, 5 spring switches & 5 signals
C&NW	25 switch heaters, 3 train order signals, 350 miles automatic train control power converted from 60 Hz to 100 Hz
CSS&SB	4 switch heaters, 2 magnetic tape recorder-reproducers
CTA	100 switch heaters
D&RGW	1 traffic light pre-empt.
DT&I	35 switch heaters, 4 hump signals
DM&IR	2 spring switches & 2 signals
EJ&E	3 grade crossing predictors, 1 spring switch & 1 signal
FEC	25 devices to operate crossing protection by Hi-Rail cars
L&N	3 grade crossing predictors
MP	10 grade crossing predictors
Montreal Metro	3 carrying tires control, 3 guiding tires control, 3 negative shoes control
NYC	2 automatic journal oilers, 2 spring switches
NYCTA	1 low shoe detector
NP	2 switch heaters, 123 mi charging line
PRR	1 signal at spring switches
PATH	1 key-operated double crossover
Reading	1 information indicator
StL-SF	17 motor-car indicators, 7 operations recorders, 2 spring switches
SP	4 spring switches, 2 facing point locks, 6 signals at spring switches
Totals **359**	
	230 switch heaters
	18 spring switches
	17 signals at spring switches

Centralized Traffic Control—1967

Railroad	Location	Road Miles	Switches	Electric Locks	Signals
A&WP	E. Point-Palmetto, Ga. (ABS)	15.8	—	—	8A
BAR	W. Seboois-Packard, Me. (ABS)	2.4	—	—	2A
B&M	Westminster-Gardner, Mass.	7.2(2)	—	—	5A
	S. Acton-Willows, Mass.	8.8	—	—	2A
	N. Chelmsford, Mass.-Nashua, N.H.	9.0	1ss	—	3C,3A
	Biddeford-Grand Beach, Me.	2.9	1	—	3C,3A
	System	—	—	9	4C
CN	St. Lawrence Region (ABS)	1.0	—	—	2A
	St. Lawrence Region	47.0(2)	39	15	49C,61A
	Great Lakes Region	49.1(2)	52	39	58C,84A
	" " "	11.5(3)	37	11	33C,38A
	" " "	4.4(4)	40	5	33C,20A
	Mountain Region	3.2	—	3	1C,2A
	Prairie Region	—	1	6	—
CP	Fort William, Ont.	—	—	—	1A
	White River-Selim, Ont.	128.4	27	5	81C,73A
	Clagary-Exshaw, Alta.	55.5	14	13	42C,26A
	Kamloops-N. Bend, B.C.	113.0	31	3	93C,68A
	Redgrave, B.C.	1.6	2	—	6C
	Port Moody-Vancouver, B.C.	19.0(2)	10+1ssl	6	18C,9A
	Winchester Sub.	2.9(3)	16	2	12C
	Adirondack Sub.	6.3(2)	3+1ss	10	2C,2A
C&O	Vauces-Columbus, Ohio	48.0(2)	12	—	19C,42A
C&NW	Mayfair-Barrington, Ill. (ABS)	24.0(3)	—	59ats	—
	Barrington-Harvard, Ill. (ABS)	24.0(2)	—	43ats	—
CB&Q	Buda-Galva, Ill.	23.1(2)	8	26	24C,20A
	W. Eola-Aurora, Ill.	2.4(3)	13	—	34C,13A
CTA	Harlem Ave.-Clinton St. Chicago (ABS)	10.0(2)	—	140cs	—
D&RGW	Pueblo-Gorge, Colo.	42.5	13	10	43C,18A
DM&IR	Wolf-Mtn Iron, Minn.	10.5	2	6	7C,3A
GN	St. Paul, Minn. (ABS)	5.1(2)	—	—	10A
	Mukilteo-Edmonds, Wash.	9.9(2)	1	2	3C,2A
GM&O	Pontiac S.-Odell S., Ill.	10.3	2	10	6C,4A
	Normal N.-Normal, Ill.	2.7(2)	—	3	—
	Prattville-Montgomery, Ala.	4.8	1	—	4C,2A
IC	Ft. Dodge-Tara, Ia.	6.0	—	—	2C,5A
LV	Cementon-Bowmanstown, Pa.	15.0	2	—	6C,6A
	Tonawanda-Batavia, N.Y.	37.0	2	—	9C,14A
	Newark-Aldene, N.J.	8.0(2)	—	—	—
L&N	Wauhatchie, Tenn.-Widows Creek, Ala.	27.0(1-2)	16	7	31C,10A
MKT	Waco, Tex	1.0	2	—	6C
MP	Newport-Nuckles, Ark.	2.0	2	—	6C
Montreal Metro	Three lines	15.1(2)	54	297ats *246ats	104C,155A
NYC	Stuyvesant-Rensselaer, N.Y.	17.4	1ssl	2	2C,8A
	Mott Haven-N. White Plains, N.Y.	18.4(2)	—	1	5C,4A

ing-light signals were installed at 1,079 crossings compared to only 761 crossings so equipped in the previous year. Flashing-light signals and automatic short-arm gates were installed at 638 crossings, also an increase from 1966's figure of 459. Although the road miles of CTC declined slightly, the number of power switches and signals installed showed considerable increases.

Also of note last year, was the completion and placing in operation of three automatic classification yards using digital computers for control, and the start of construction of a fourth such yard. Three other digital-computer controlled yards will be started in 1968.

In the area of rapid transit signaling, Chicago Transit Authority placed in service a portion of cab signal system on the Lake street line (See RS&C December 1967, pages 13-17). A feature of the system is that no insulated joints are required with the audio frequency track circuits. Similar cab signal systems are to be employed by the transit systems in Cleveland and Boston.

Other transit signaling news included the award to Westinghouse Electric Corp. for its low bid of $26.2 million for the automatic control and communications system for BARTD (See RS&C December 1967, pages 18-23).

The Montreal Metro placed 15 miles of double-track line into service during 1967. A total of 297 wayside train stops were installed and 246 units of rolling stock were equipped with trip mechanisms.

American Telephone & Telegraph Company's bulk communications rates, known as the Telpak tariff, were finally issued in revised form on August 1, 1967. The revised rates were actually private line rates which eliminated Telpak A (12 voice channels) and B (24 voice channels). Telpak C (60 voice channels) and D (240 voice channels) tariffs remain the same. At the request of the FCC, AT&T has postponed revision of teletypewriter equipment rate changes. The result of these various changes and some withholding of rate changes has been an orderly transition for communications users. True, some railroads have protested to the FCC and the courts about the rate increases as a result of eliminating Telpak A and B tariffs, but in general railroads made the adjustment without catastrophic results. The rate revisions were forecast in late 1966 and announced in May 1967, but held in abeyance until August 1, 1967.

Also of help is the easing of microwave sharing rules by the FCC, which permits greater sharing of such facilities by regulated industries. Thus, many railroads have or are looking to this means for obtaining increased communications circuits. Those roads with system-wide microwave networks may be in a position of having more capacity than they can use themselves. Hence, they can lease circuits or groups of circuits to other railroads.

In summary, while 1967 turned out to be a good year for signaling and communications equipment installations, 1968 promises to be even better. **RS&C**

Centralized Traffic Control—1967

Railroad	Location	Miles Road	Switches	Electric Locks	Signals
	Athol Jct.-Springfield, Mass.	2.3(2)	—	1	—
	Collinwood, Ohio	3.0	—	1	—
	E. Pinola-Porter, Ind.	15.5(2)	—	4	1C,18A
	Cincinnati, O.-Lawrenceburg Jct., Ind.	18.0	—	8	2C,4A
	Millard, Ind.-Sanlford	7.5	1	—	3C,1A
	Indianapolis, Ind.	1.0	—	—	2C
NYCTA	IRT 125-138 Streets (ABS)	1.3(4)	—	36ats	36A
	IND 4-34 Streets (ABS)	1.0(2)	—	13ats	13A
	BMT Bowery-Canal (ABS)	1.0(4)	—	36ats	36A
N&W	Alnwick-Devon, W.Va.	10.3(2)	10	5	16C,12A
	Wharncliffe-Gilbert Yd., W.Va.	13.3	—	—	8C,4A
	Kimball-Bellevue, O.	4.0	2	2	7C,1A
	Peru-Ft. Wayne, Ind.	51.0	6	9	24C,6A
NP	Paradise-Tuscor, Mont.	60.0	9	18	27C
ONL	North Bay-Englehart (ABS)	—	—	1	—
PRR	Harrison-Kearny, N.J. (ABS)	1.7	—	—	3A
	Marysville-Rockville, Pa. (ABS)	3.0	—	—	2A
	Monongahela-Shire Oaks, Pa. (ABS)	4.9(2)	—	1	3A
	System	—	—	74cs	—
	Newark-Kearny, N.J.	3.7	—	—	4A
	Philadelphia, Pa.	2.1(2)	—	—	—
	Baltimore-Halethorpe, Md.	5.7	—	—	2A
	Mifflin-Wall, Pa.	3.4	—	—	1C,2A
	Pittsburgh, Pa.	8.1	—	1	2C
		2.7(2)	—	4	2C,4A
	Akron-Arlington, O.	1.3(2)	—	4	—
	Lock Haven-McElhattan, Pa.	3.4	—	—	1C,2A
	Oil City, Pa.	2.8	2	—	4C
PATH	Newark-Harrison, N.J.	2.0(2)	—	13ats	14A
SCL	Richmond, Va.	—	2	—	4C
	Dillon, S.C.	—	2	1	—
	Georgia and Florida	—	—	2	—
	Callahan, Fla.	—	8	1	8C
SP	Connell-Beaumont, Tex.	6.5	4	1	10C
SP&S	Wishram, Wash.-King (ABS)	77.7	—	—	98A
TRASt.L.	St. Louis, Mo. (ABS)	3.0	—	1	5A
UP	Hinkle-Biggs, Ore.	84.1	24	18	72C,60A
Totals	CTC Road Miles	**1075.4**	**473+2ss**	**497ats**	**943C**
	CTC Track Miles	**1371.5**	**2ssl**	**214cs**	**1,055A**
	ABS Road Miles	**183.1**		**246ats***	
	ABS Track Miles	**290.2**		**277el**	

C = Controlled signals
A = Automatic signals
ssl = Spring switch with facing point lock
ss = Spring switch without facing point lock
ats = Automatic train stop
cs = Rolling stock equipped with cab signals
*ats = Rolling stock equipped with automatic train stop

Pole Line Construction—1967

Railroad	Miles of New or Rebuilt Pole Line	Miles or New Wire Installed
Alaska	10	—
AC&HB	38	—
BAR	—	11 ics
B&LE	—	1 bhd, 4 ihd
CN	56	1,770 ia, 1 ics
CP	2	268 ia (ACSR), 14 bhd
C&O	86	63 bhd
B&O	280	70 bhd
C&NW	170	572 ics
C&WI	—	1 ihd
CB&Q	21	—
CMStP&P	247	—
CRI&P	3	335 bcs, 97 ics
D&H	1	4 bhd, 50 ics
D&RGW	8	—
DT&I-AA	10	10 ics
DM&IR	14	84 ics, 8 ihd
EL	48	76 ia
GN	3	158 ics
IC	—	10 bhd
KCT	1	1 ia
LI	6	5 bhd, 4 ihd
L&N	190	102 ia
MEC	20	—
MKT	80	—
MP	24	380 ia (Steel core)
NYC	20	—
N&W	75	7 ia, 90 bhd
NP	56	54 bhd
ONL	6	—
PRR	13	—
Reading	3	6 bhd
StL-SF	80	—
SCL	282	—
TH&B	—	2 ia
Union	1	1 bhd
UP	200	—
WM	45	—
WP	53	—
Totals	**2,152**	**4,259**

bcs = bare copper-covered steel: 335
bhd = bare hard drawn copper: 318
ia = insulated aluminum: 2,606
ics = insulated copper-covered steel: 983
ihd = insulated hard drawn copper: 17

Intercom Systems—1967

Railroad	and Facility	Speakers	and Phones
B&LE	1 yard	4 p	—
	2 systems	—	5 t
B&M	1 yard	5 p	—
CN	1 freighthouse	60 s	75 t
CP	3 yards	9 tb	—
	2 offices	2 s	3 t
	1 freighthouse	—	1 t
	1 shop	—	3 t
C&O	2 yards	65 tb	36 p
B&O	2 yards	20 tb	14 p
	2 systems	94 s	80 t
C&NW	1 yard	10 tb	—
	1 system	6 s	—
CB&Q	1 shop	64 s	23 t
CMStP&P	2 yards	12 tb	4 p
	1 station	10 p	—
	1 tower	6 tb	4 p
	2 offices	13 s	—
CTA	4 yards	19 tb	16 p
DT&I	1 yard	46 tb	—
	2 offices	4 s	—
DM&IR	1 yard	3 p	—
	1 system	2 s	2 t
EL	1 office	3 s	—
FEC	1 yard	11 s	1 t
GN	2 offices	8 s	6 t
	2 shops	24 s	6 t
GM&O	1 yard	3 tb	—
IC	1 yard	15 tb	—
	2 offices	13 s	26 t
LI	1 yard	6 p	—
L&N	4 yards	32 tb	12 p
	2 offices	3 s	25 t
MP	2 yards	6 tb	2 p
	1 freighthouse	12 s	40 t
Montreal Metro	28 passenger sta.	28 s	—
NYC	4 yards	55 tb	60 p
	3 offices	24 s	—
NYCTA	3 yards	34 tb	34 p
	system stations	1200 s	110 t
N&W	1 yard	20 tb	—
	3 offices	41 s	15 t
NP	1 yard	22 tb	10 p
	2 freighthouses	16 s	—
	2 offices	5 s	22 t
	1 shop	5 s	—
PRR	1 yard	4 tb	—
	1 station	—	45 p
	1 office	—	40 t
Reading	1 office	5 s	—
SCL	1 office	12 s	--
SOU	1 yard	20 tb	19 p
	offices	—	55 t
	1 freighthouse	6 s	—
SP	7 yards	50 tb	27 p
TRAStL	1 yard	4 tb	--
Totals	**119**		**2,962**

24 offices
5 shops
6 freighthouses
30 stations
1 tower
6 systems
47 yards

tb = Talk-back speakers: 452
p = Paging speakers: 311
s = Speakers: 1,661
t = Telephones: 538

Radio Equipment—1967

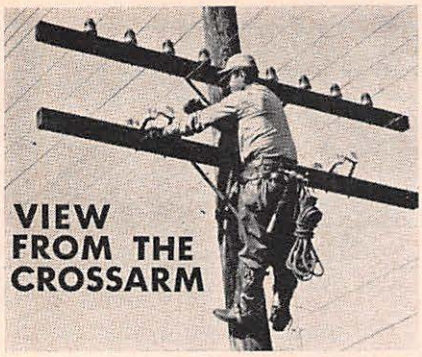
Railroad	Mobile Stations	Base Stations	Walkie-Talkies
Alaska	1L, 1C, 1A	—	—
A&S	2A	—	12
AT&SF	224C	5R	—
A&WP	4L, 1M/W	1R	3
Ga.	8L, 4M/W	4R	10
WRyA	5L, 1M/W	—	4
BAR	1A	—	—
B&LE	8L, 1M/W 1 shiploader	1R	5
B&M	10M/W	1R, 1Y	8
CN	76L, 150C, 83A, 17M/W	12R, 6Y	299
CP	9A	2Y	21
C&O	18L, 32C, 18A	7Y	—
B&O	8L, 17A	3Y	72
C&NW	10L, 27A	16R, 8Y	43
CB&Q	32L, 50C, 54A	8R	28
CMStP&P	33L, 7A, 1 crane	—	10
CRI&P	63L, 75C, 44A, 20M/W	9R, 3Y	106
CSS&SB	2L, 1M/W	—	—
Cleveland TS	—	—	2
D&H	17L, 8C, 32A, 3M/W	1Y	14
D&RGW	22L, 5A, 1M/W	4R, 5Y	20
DT&I	1L, 2A	3Y	2
DM&IR	2A	1Y	15
EJ&E	1M/W	—	—
EL	24L, 39A, 6M/W	1R	23
GN	36L, 10A, 10C	10R, 3Y	69
GB&W	1C	—	—
GM&O	3L, 37C, 2A	3R	12
IC	90L, 9A	11Y	230
IT	3A	1R, 1Y	6
KCT	11A	1Y	15
K&IT	—	1Y	6
L&HR	3L	1R	—
LI	1A	—	20
L&N	33L, 50C, 60A 2 wreckers	77R, 15Y	54
MEC	13L	—	5
MKT	15L	—	—
MP	26A, 3M/W	24R, 2Y	29
Montreal Metro	146 Transit cars 50 mobile sets	9R	15
NYC	209L, 52C, 351A	22R	84
NYNH&H	36L, 21C	13R, 1Y	10
N&W	42L, 32A 3 car ferrys	10R, 12Y	72
NP	16L, 17A, 3M/W	3R	30
ONL	1A	6R	—
PGE	3L, 5C, 5M/W	2R	10
PRR	121L, 12A	37R, 8Y	76
Reading	15L, 52C, 4A	—	—
StL-SF	8L, 3A, 2M/W	1R, 2Y	74
SCL	56L, 50C, 31A 3 derricks	6R, 6Y	223
SOU	60L, 67SL, 15C, 11A, 2 derricks, 1 off. car	14 R	69
SP	155L, 50C, 21A, 5M/W	8R	38
SP&S	6L	—	—
TH&B	4L, 3A	3R, 1Y	12
Union	2A	—	15
UP	150L, 250C, 20A	5R	—
WM	1L, 5A, 4M/W	2R, 1Y	17
WP	5L, 6M/W	—	6
Totals	**3,831**	**424**	**1,894**

L = Locomotives: 1,412 R = Road base stations: 319
C = Cabooses: 1,133 Y = Yard base stations: 105
A = Automobiles: 978
M/W = Maintenance of way equipment: 94
67SL = 35 locomotives and 32 slave cars equipped for radio remote control.

Carrier Equipment—1967

Railroad	Terminals	Repeaters	Printing Telegraph
Alaska	6MWv	—	1TR, 1RR
AT&SF (5PE) (2MWsta.)	—	—	—
BAR	42v	11v	—
B&LE	4v, 4t	—	—
B&M (2MWsta.)	—	—	—
CN (11PER-1,850L)	484MWv, 414v, 846t	—	2,050TR, 54RR
CP (5PER-104L) (1PEL-2L)	1MW (240KHz) 45v, 185v, 236MWv, 1,527t	128t	—
CNJ (1PEL-40L)	—	—	1TL
C&O (1PEL-125L)	—	—	26TL, 14RL
B&O (3PEL-139L)	26v	2v	94TL, 32RL
C&NW (2PER-160L)	86v, 2s	6v	7TL
C&WI (1PER-10L)	—	—	—
CB&Q (9MWsta.)	30v, 48s	9v	10TL, 27RL, 19RR
CMStP&P (2PER-74L)	2v, 10s	4t	1TL, 31TR, 25RR
CRI&P (4PER-155L)	32v	6v	6TL
D&RGW	40MWv, 12MWs, 46MWT	—	58TR, 4RR
DT&I	—	—	6TL, 1RL
DM&IR (1PER-70L)	2v	—	—
EL (2PEL-30L)	22t	23t	24TL, 24RL
GN	12MWv, 24v	2v	20TL, 20RL
GM&O	8v, 4s	—	1TR
IC (1PER-200L) (4PEL-1500L)	16v, 2s, 22t	1v	60TL, 6TR 30RL, 6RR
LV (4PEL-500L)	—	—	8TL
L&N (3PER) (4MWsta.)	22v, 24t	4v	—
MKT	2v	—	—
MP (6PER-175)	76v, 20s, 26t	11v	9TL, 3TR, 1RL
Montreal Metro (1PER-260L)	200v	—	—
NYNH&H	—	—	2TL, 2RL
N&W (1PER-100L) (4MWsta.)	78v, 4s	17v	1TR, 1RR
NP (1PER-57L) (36MWsta.)	6v, 138MWv, 3t, 16MWt	1v	4TL, 5TR, 5RR
ONL (3MWsta.)	47MWv, 20t	—	10TL
PGE (4MWsta.)	32v, 4s, 10t	—	2TR
PRR (1PEL)	46v, 8s, 4t	18v, 1s	1TR
RF&P	2t	—	—
StL-SF	—	—	30TR
SCL (4PEL-240L)	32v	2v	2TR, 2RR
SOU	62MWv	—	—
SP (13MWsta.)	—	—	—
TH&B	2v	—	1TR
UP (1PEL-50L) (2MWsta.)	6v, 24s	3v, 3s	20TR, 2RR
Totals	**5,108**	**297**	**2,770**

PEL = Phone exchange leased: 22—2,626 lines
PER = Phone exchange railroad owned: 39—3,215 lines
L = Lines off automatic phone exchanges: 5,841
MWsta. = Microwave stations: 79
v = Voice only; s = Speech plus telegraph; t = telegraph only or data
TL = Teletypewriters (SO, RO and SR) leased: 288
TR = Teletypewriters (SO, RO and SR) railroad-owned: 2,212
RL = Reperforators leased: 151
RR = Reperforators railroad owned: 119
1,373 Voice terminals; 126 Speech plus telegraph terminals
2,510 Telegraph terminals; 1,025 Microwave voice terminals
12 Microwave speech plus telegraph terminals
62 Microwave telegraph terminals; 138 Voice repeaters
4 Speech plus telegraph repeaters; 155 Telegraph repeaters



REB to offer signal course

In the June 1967 issue of this magazine three questions relating to the training of signal employees were posed in the Editor's Corner: (1) Who is to be trained? (2) What are you going to teach the people being trained? (3) Who is going to do the teaching?

At least two of the questions can be answered by this April because the Railway Educational Bureau of Omaha, Neb. is now in the process of preparing a completely new signal training course. Efforts will be confined to signaling, and the study of electricity and electronics will be limited to the applications of those technologies in the field of railroad signaling. In other words, this is to be a practical course for practical men, designed to prepare the new assistant signalman to cope with those problems which will confront him after he has attained the position of signalman.

The course offered some time ago by the Railway Educational Bureau was a two-year course. However, studies have indicated that the technology of signaling has expanded at such a terrific rate over the past several years that even an accelerated course will take a minimum of three years to cover all of the subjects with which a signalman must familiarize himself. REB is designing its course to cover a 36-month period. This new training course will provide the student an opportunity for re-examination where necessary within the four-year assistants' training program.

An introduction to the course will provide a general introduction to each subject covered and will also contain reasons why the course is offered and why a signalman should take it.

The course lessons will include: introduction to signal equipment; history and development; circuit diagrams and blue prints; wire and cable; electricity and magnetism; storage batteries; rectifiers, meters and test equipment; transformers; signal power transmission, track circuits; relays; fundamentals of signaling; protective devices; interlockings; switch machines; remote control; basic electronics; carrier controls; centralized traffic control and traffic control systems; highway grade crossing signals; cab signaling and train control; car classification yards; hotbox detectors, and other safety detectors.

History and development will provide a brief non-technical background to familiarize the student with the field and show his relationship to the field. It will also emphasize the part signaling plays in railroad economics and safety.

Introduction to signal equipment will be more of an encyclopedia of signal equipment, giving descriptions, signs and symbols, and the application of specific components. While it will be descriptive, technical details will be held to a minimum. The more technical aspects will be treated in subsequent lessons directed to the specific subject or function. In effect, this manual will be used as a reference text throughout the course and should be most useful to the employee after he becomes a qualified signalman.

Circuit diagrams and blue prints, used in conjunction with the reference text, will be designed to teach the student how to read signal circuit diagrams and blue prints.

Wire and cable is designed to teach the student to recognize the equipment in this category. It will also explain installation techniques as well as illustrating appliances used in power distribution circuits for signal systems.

The study of electricity and magnetism will include only basic theory and is directed towards application in signal appliances. AC motors, DC motors, circuits, and Ohms law will be covered in this study to permit the student to review his understanding of the field and direct his attention to the way it is applied to signaling.

Storage batteries used in signaling, their characteristics, installation, operation, charging requirements, maintenance and precautions to be observed will be covered in this lesson.

The construction and operation, adjustment and output of rectifiers, rectifier-transformer assemblies and locating trouble in the equipment are the main divisions of the lesson covering rectifiers.

The study of meters and test equipment is important to the future signalman. Test and inspection are necessary to any program of preventive maintenance. The basics of meters, DC ammeters, DC voltmeters, ohmmeters, insulation testers, AC measurements, vacuum tube voltmeters, introduction of oscilloscopes and fault locators are treated in the comprehensive instructions contained in this lesson.

Transformers and their use in signaling should be thoroughly understood by the time the student has completed this lesson. The installation and maintenance techniques peculiar to railroads and signaling will be covered extensively to prepare the student for his role of the future as a trained signal technician and maintainer.

Signal power transmission is a practical discussion of power transmission systems used as a supplement to the signal system. This will extend the effectiveness of the lesson on wire and cable.

Track circuits will be discussed in a series of texts. They will not be consecutive but will be fit into the

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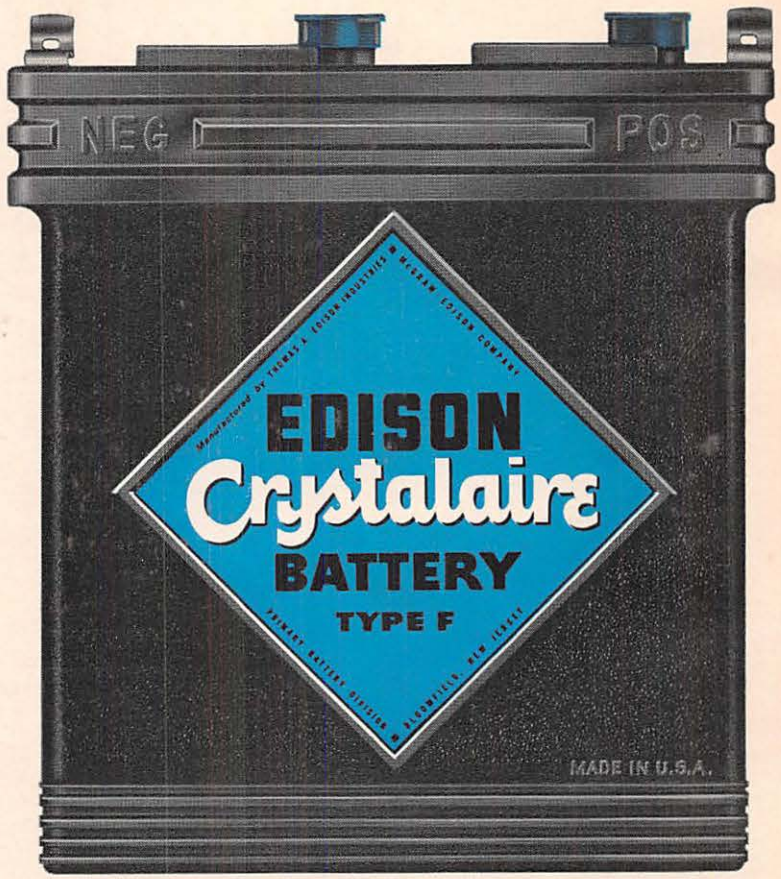

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schedule as the track circuit technique is introduced in the subject matter and discussed in the system. The student will be familiar with these circuits before he is required to study their application and will include basic circuits, and the more sophisticated frequency overlay and electronic track circuits.

A series of texts on DC and AC relays will be offered to familiarize the student with the use of relays in signal systems and to instruct him in maintenance and test procedures as well as a recognition of the various types of relays and the functions they perform in the system.

After the student has been thoroughly schooled in the unit and component parts of the systems he will be required to study the fundamentals of signaling. At this point he will move into the more technical aspects of signaling systems and will be introduced to the automatic block systems, followed by a study of protective devices used in conjunction with ABS. This will include a study of the various detectors, locks and other block signal adjuncts.

The student will be briefly introduced to interlockings before he is required to study remote control and centralized traffic control. A series of texts on interlockings including electro-mechanical; electric; automatic; relay; and entrance-exit will be offered later in the course after the student has had an opportunity to study switch machines and remote control.

That portion of the training course devoted to switch machines will offer technical information, descriptions, applications, installation, maintenance and repairs. This material will also be offered in a series of texts designed to simplify the job of understanding this complicated equipment.

Carrier controls and their application to remote control of centralized traffic control will be taught, emphasizing adjustment and maintenance of the equipment. The technical aspects of carrier, so far as the signalman is concerned will be discussed in detail.

Centralized traffic control will be offered in a series of texts and will deal with the technical aspects of CTC and TCS. Installation, repair, and maintenance techniques will be covered to make this a series of vital importance to the potential signalman.

The study of highway grade crossing signals will also be covered in a series of texts designed to direct the attention of the student to a specific point. These lessons are important to the signalmen as the subject is important, one having a broad and direct impact on the public. At present this is in the public eye. Texts will cover: Special track circuits for crossing protection; flashing-light signal nomenclature; crossing gate nomenclature; interlocking and flashing relays (also includes information on solid state devices being used); installation and adjustment; special purpose circuits; tests and inspections; maintenance techniques; and the Grade Crossing Predictor.

Cab signaling and train control will be a series of lessons dealing with the subject progressively and end with a study of repair and maintenance of the system and its components.

Signal Inspection Act is under the Department of Transportation and covers Rules, Standards and Instructions for installation, inspection, maintenance and repair of automatic block signal systems, interlocking traffic control systems, automatic train stop, train control and cab signal systems and other similar appliances, methods and systems (Ex Parte 171). Applicable rules from Ex Parte 171 will be quoted and discussed throughout the lessons to impress upon the student that his actions are not only important to the operation of the railroad, but are in fact to a great degree controlled by federal law and subject to test and inspection by inspectors representing federal agencies. A lack of knowledge or slothfulness on the part of a signalman would both jeopardize his position and seriously affect his employer, the railroad.

Car classification yards will be a series of texts covering: (A) brief outline and introduction to basic elements, yard function, and how the signalman fits into the picture; (B) retarders: how they operate, adjustment, repair, maintenance and tools; (C) retarder control: the general scheme of retarder control including measuring devices, their repair, adjustment and maintenance; (D) automatic switching: what it does and how it works, tests and procedures; (E) hump wayside and cab signaling.

Hot box detectors will consist of a series of texts covering a general introduction, application and purpose, description, how they work, the signalman's responsibility, installation, adjustment, maintenance, carrier application, reading the charts, and types of equipment. **RS&C**

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The Bureau operates its service almost entirely by mail from the Omaha, Neb. office. Records are kept on each student's progress, tests are painstakingly graded and students are offered staff assistance in the event they're having trouble with lesson material. In most cases, students' grades are sent along to their supervisors on the railroad.

Methods of study vary from road to road. In some cases, the program is conducted in conjunction with on-the-job and classroom study. With many subscribers, REB work is on an at-home basis.

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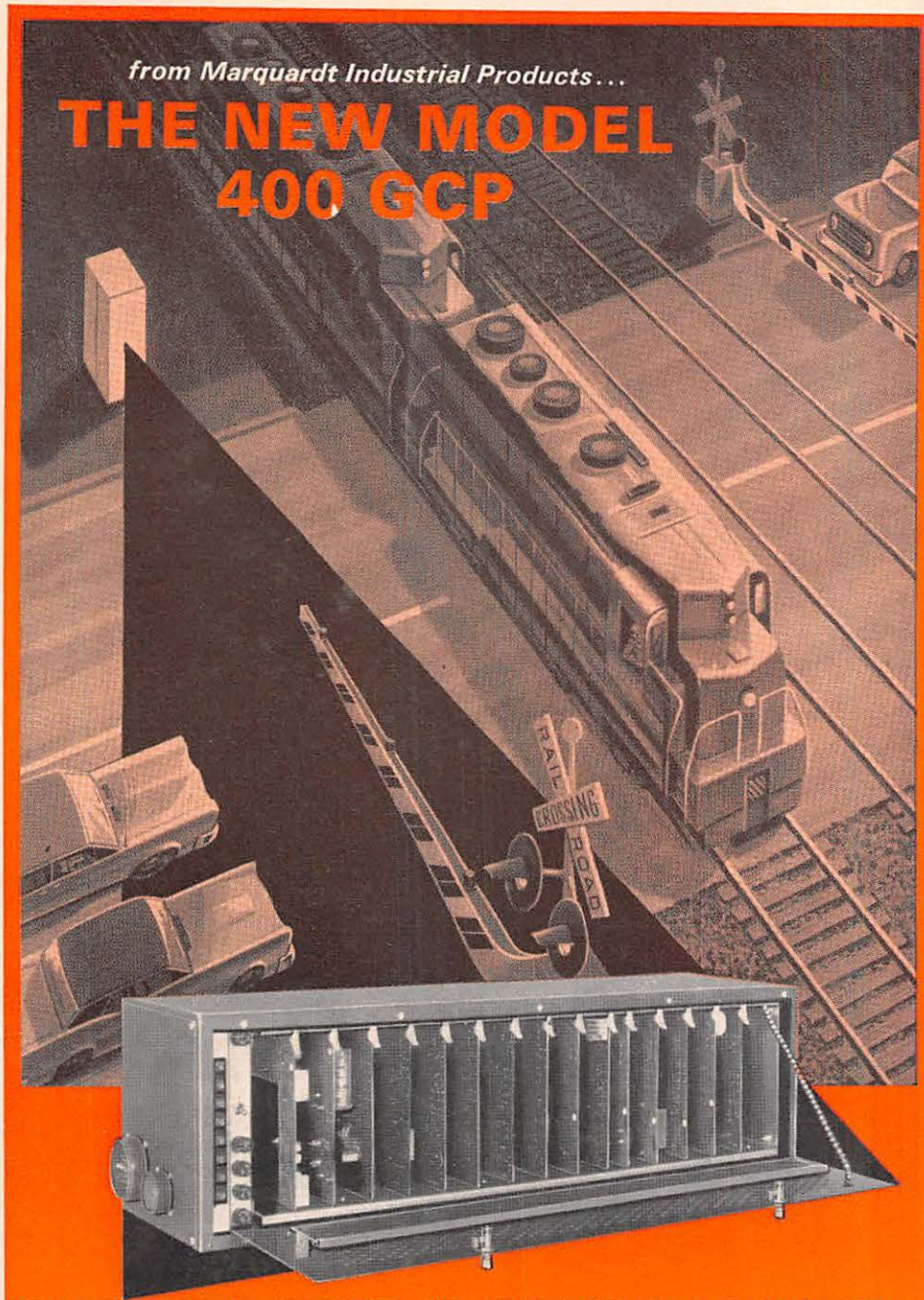

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Railway Cybernetics

Controls and the Computer: 6

How a digital computer controls a class yard

By Franklin George

A railroad's prime source of income is derived from moving goods from consignor to consignee. Two factors are important to obtaining this income: (1) the quality of service; and (2) the cost of providing the service. An important area in this movement of goods is the handling or "processing" of freight cars in a terminal.

We will look at how modern electronic equipment, including a programmed digital computer, can be used to automate this process and thereby enable the railroad to improve the quality of the service it provides, and do this at minimal cost per car processed. We must first plan our terminal "process control" system.

Figure 1 shows the functional scope of the system we are planning. Note that it extends in territory, and in time, from the train that is approaching the terminal to the train that has departed.

This is because we desire to advance plan for the arrival and handling of incoming trains. Also, we want our railroad's central car records and information system to be informed on an up-to-the-minute basis regarding trains and their consist that have departed our terminal.

The operating functions that we plan to monitor and control include getting the train into the receiving yard, and to the hump. From here, we concern ourselves with cars, or cuts of cars, onto the class tracks, and from there, blocks of cars onto tracks in the departure yard where we make up outbound trains.

Figure 2 shows the manner of operating status information and data handling, or clerical work, that we provide for the different segments of the process.

The information that is made available, and for the most part automatically updated and produced, enables management, operating, and maintenance personnel to work most efficiently. It provides up-to-the-minute information of the status of all phases of operation: where trains are, of what they consist, when they are ready to hump, where cars, or groups of cars are—and what the status is of trains in the departure yard.

The train logs, elapsed time reports, and equivalent data, enable management to evaluate the over-all operation—or any phase of it.

Control system reports, which include equipment failure reporting, enable maintenance personnel to zero-in quickly on trouble spots.

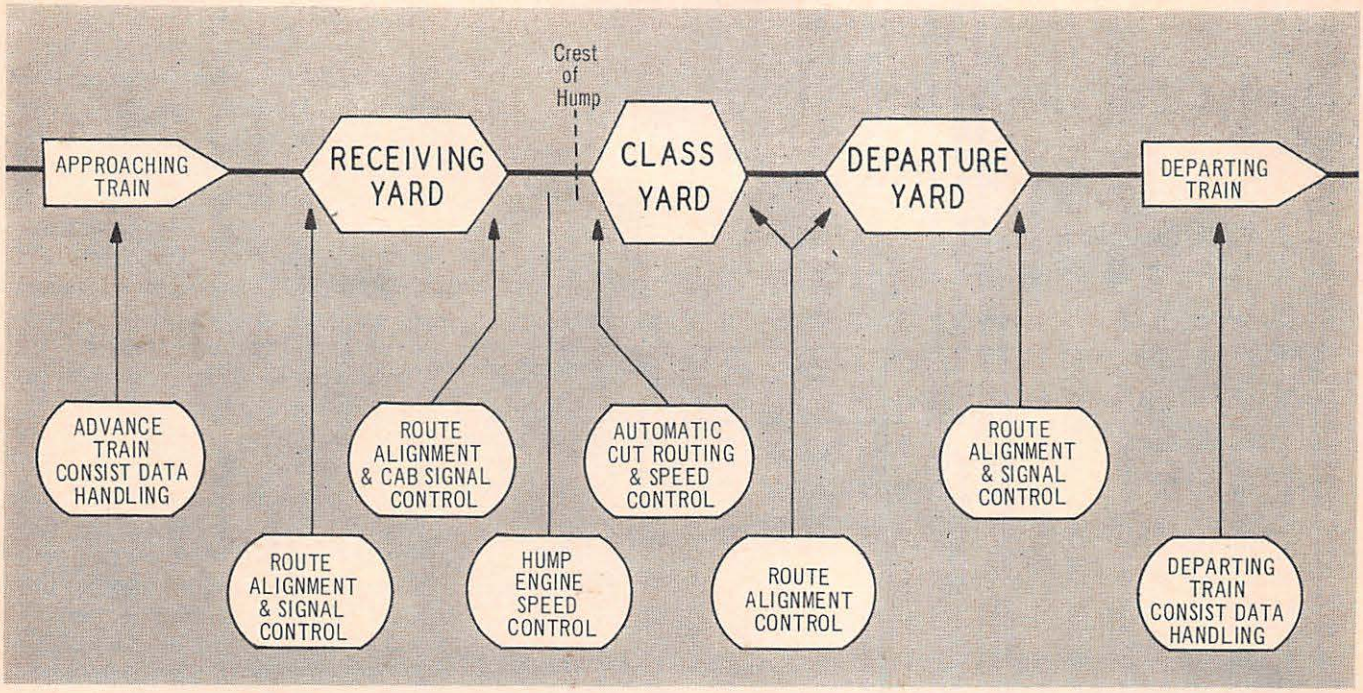
The digital computer and its program constitute the major element as far as providing automation capabilities is concerned. Every computer system has as its heart a central processing unit, with its arithmetic section, control section, core storage, in-out channels, peripheral buffer, and so on (Figure 3). We have to store large quantities of data for indefinite periods of time, so we have a random access storage unit—a magnetic disc file, or a drum assembly.

To get field equipment status information input to the central processing unit, and control commands output from it to the field equipment, we require interface equipment. This isolates, electrically, the computer system's internal circuitry from outside world circuitry while enabling the two to communicate, one with the other. In a similar manner, we have man input and output interface, commonly referred to as "peripheral devices". The equipment just mentioned comprises the "hardware" portion of the computer system. It cannot do a bit of work without the "software" portion—the program. It is this that provides the central processing unit the instructions it requires—what to do when, how to do it, and the formulas it must apply to the mathematical functions it handles for us.

Well in advance of the train's actual arrival on our terminal approach, we receive, via the railroad's communication system, the train's "Advance Consist" data (Figure 4). This provides us the train's identity and pertinent data, along with data for each of the cards in the train: their initials and numbers, load or empty, kind of car, weight—if available, destination code, and other data. This data is input to the computer system directly via a high-speed data link, or via punched cards produced locally and inserted into a card reader. Following its entry, the computer system initiates on the en-route display the display of the

Mr. George is Director, Transportation Automation Systems, General Railway Signal Co. This article is an abstract of an address presented Dec. 18, 1967 before the Maintenance-of-Way Club of Chicago, Ill.

1—Functional scope of computer-controlled yard



train's symbol, direction, number of cars, and estimated time of arrival.

Concurrent with this, the computer system translates the cars' destination codes into group, or block, identities, as they pertain at this terminal. From this, it produces a printout showing for this train the identity of all groups, or blocks, of cars in the train, and the number of cards in each. We refer to this as the "group tally". It also adds this group tally to those it has in memory for other enroute approaching trains. The resulting total "enroute group tally" will be printed out in response to a request input via any input/output teletyper.

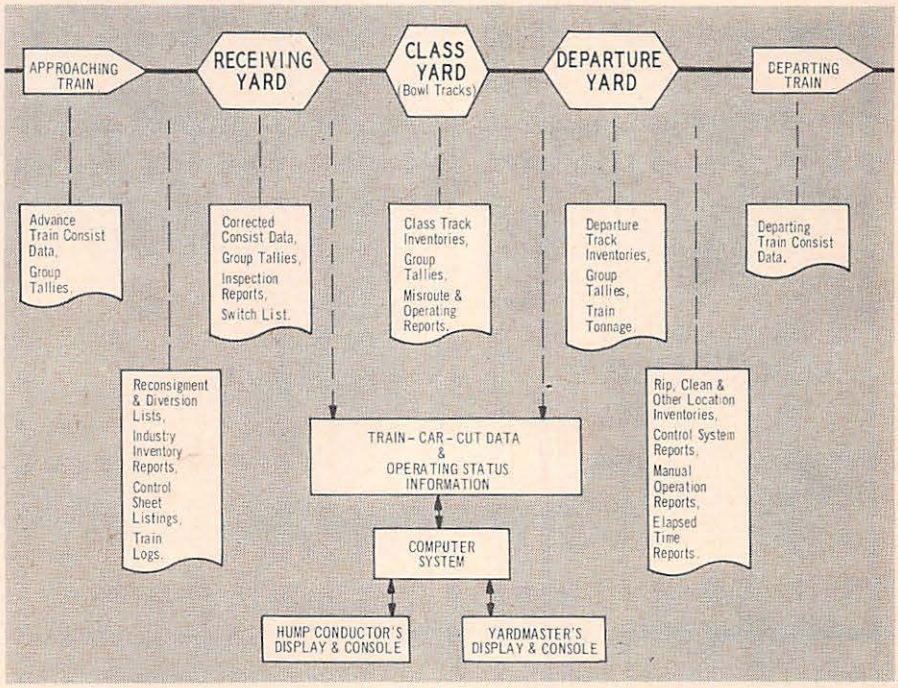
Following receipt of information regarding the approaching train, the yardmaster, or director of operations, as the case may be, can begin fitting the handling of this train into his work plan.

The first thing he does is assign a receiving yard track to the train. This he can do via his input/output typewriter by simply typing— DA 3 MB 1. This instructs the computer system to make an entry on Display A, Line 3, reading MB 1. A glance at the receiving yard display now shows that receiving yard track 3 has been assigned to train MB 1, not yet arrived (Figure 5).

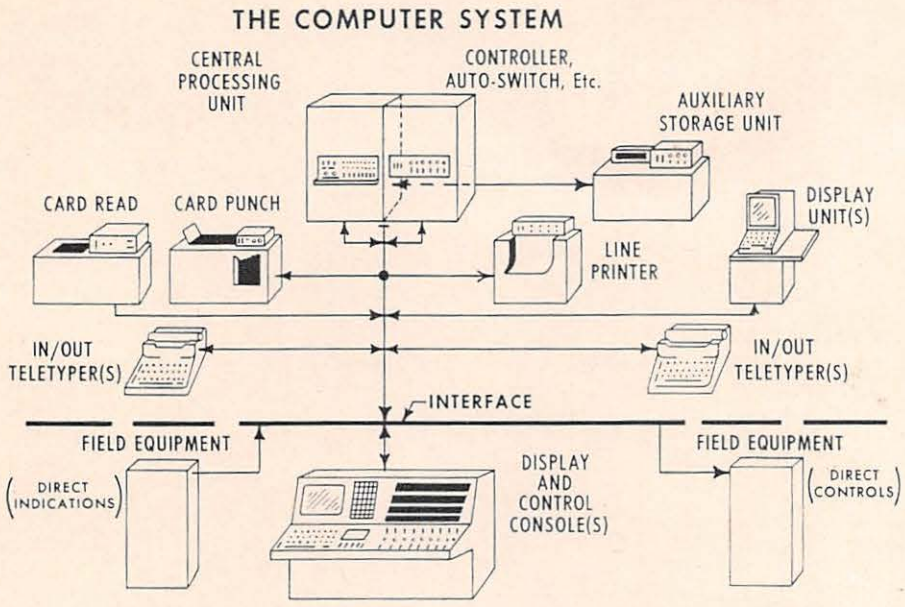
When MB 1 arrives on the approach to the yard, the computer system issues commands for the lining up and locking of a route from the approach lead to track 3 in the receiving yard. When the route is lined and locked, it will control the yard track indicator to display the track number (Figure 6).

On the approach lead, at or near the yard track indicator, we have a remote controlled video scanner, or TV camera. It scans the arriving train, viewing car initials and numbers. This scan is recorded on video tape at the office. The tape is viewed on a CRT screen at any convenient time. The viewer inputs the car initials and numbers to the computer system via an input typer. The computer system checks them against the advance consist data in memory. If differences in sequence are detected, corrections will be made automatically. If cars are detected missing, or there are added cars, the computer system will provide a printout listing them. If added cars, data for them may be input via cards

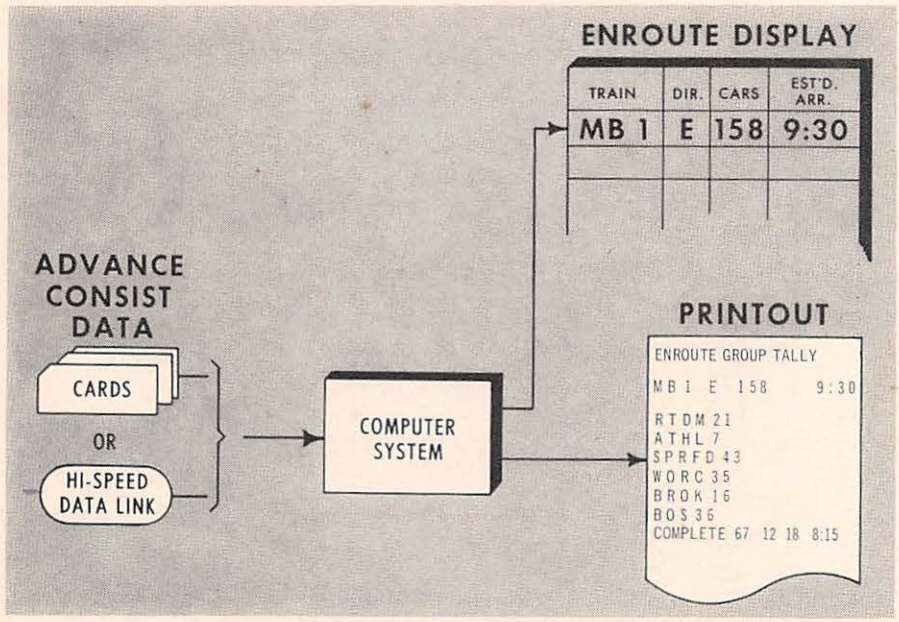
2—Operating status & data handling


APPROACHING TRAIN
RECEIVING YARD
CLASS YARD (Bowl Tracks)
DEPARTURE YARD
DEPARTING TRAIN
Advance Train Consist Data, Group Tallies.
Corrected Consist Data, Group Tallies, Inspection Reports, Switch List.
Class Track Inventories, Group Tallies, Misroute & Operating Reports.
Departure Track Inventories, Group Tallies, Train Tonnage.
Departing Train Consist Data.
Reconsignment & Diversion Lists, Industry Inventory Reports, Control Sheet Listings, Train Logs.
TRAIN-CAR-CUT DATA & OPERATING STATUS INFORMATION
Rip, Clean & Other Location Inventories, Control System Reports, Manual Operation Reports, Elapsed Time Reports.
COMPUTER SYSTEM
HUMP CONDUCTOR'S DISPLAY & CONSOLE
YARDMASTER'S DISPLAY & CONSOLE

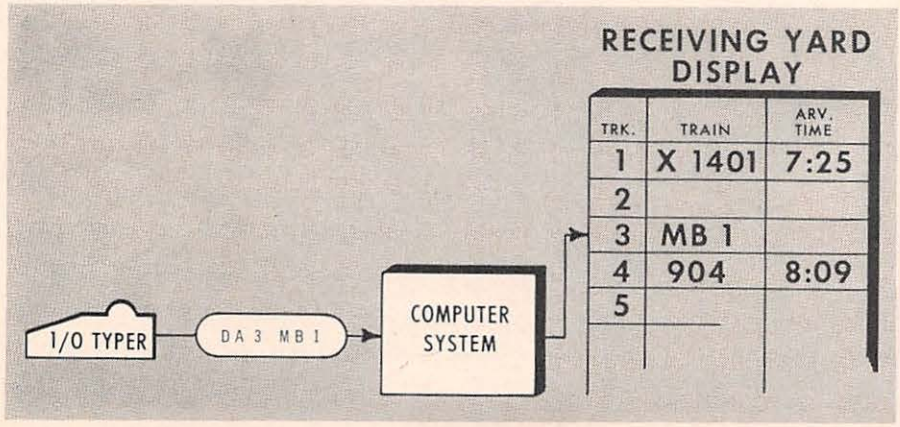
3—Computer and major components



4—Yard receives advance data



5—Inbound train gets a yard track



or an input typer. The computer system scans the car's destination codes and assigns class tracks in accordance with preprogrammed class track group assignments. It also designates what car or cars will comprise the individual cuts.

This TV camera/video tape scheme for checking the consist of arriving trains is in lieu of automatic car identification. When ACI is available, and in use universally, car initials and numbers will be input to the computer automatically.

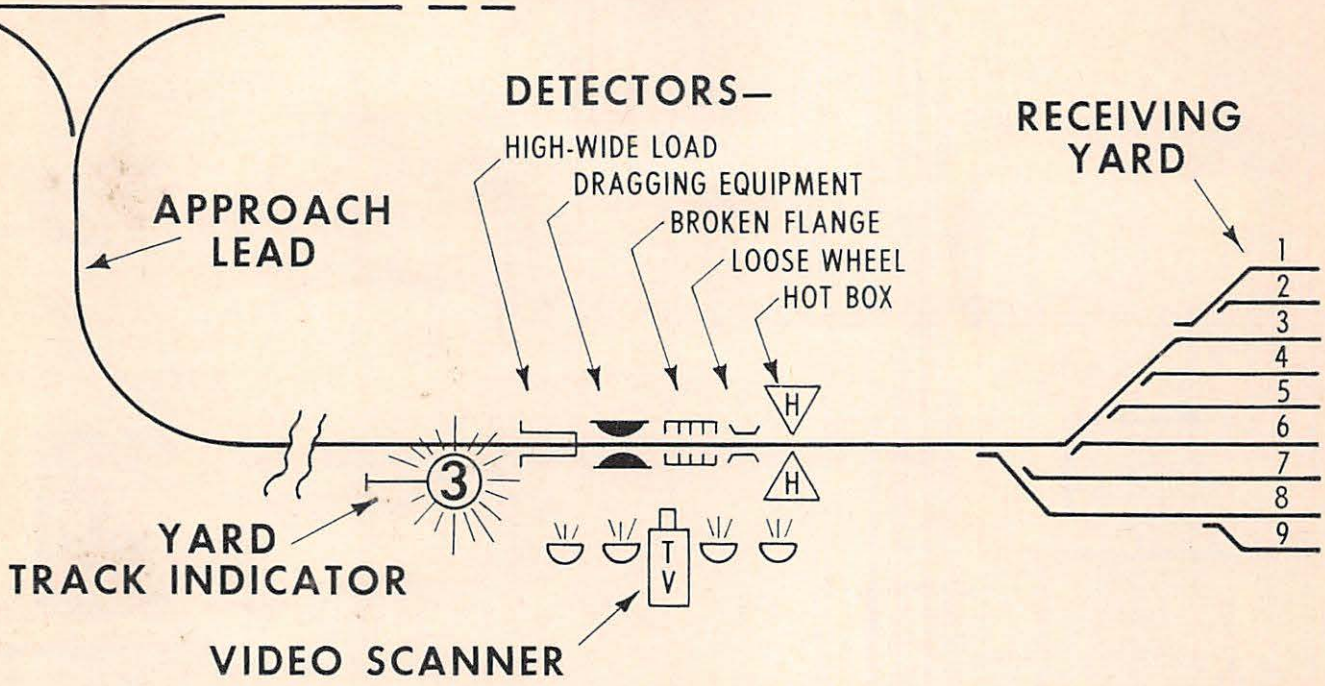
We also have on the approach lead what we might term an automatic inspection station. This may be comprised of high-wide load, dragging equipment, broken flange, and loose wheel detectors. There are also hotbox detectors. Actuation of any of these detectors may be indicated locally in a manner that will enable the event to be recorded on the video tape, readily identifiable with the car concerned when the tape is viewed on the CRT screen. They can also be automatically input to the computer system. With this arrangement, defects are detected and the inspection-repairmen alerted to the situation so that appropriate action can be taken while the train is in the receiving yard.

When the train is yarded on the receiving yard track, the computer system records the time it arrived (Figure 7). Bleeding and inspection, plus minor repairs, may be done immediately following the train's arrival. The beginning and completion of these operations are input to the computer system from field pushbuttons located at either fixed points, or carried by portable radio transmitters. Each of these events are displayed on the receiving yard display so that the status of a train can be readily seen. The computer system records each of these events, and the times they occurred.

When the computer system determines it has data for all cars actually in the train, it will indicate on the receiving yard display that the switch, or cut list, is available. This list is not printed out at this time—because it is produced on the highspeed printer in a very short time, and there might arise some last minute changes in the handling of some cars before the list is actually needed.

When the yardmaster sees that the train on track 3 is ready for

6—TV or ACI reads car initials and numbers

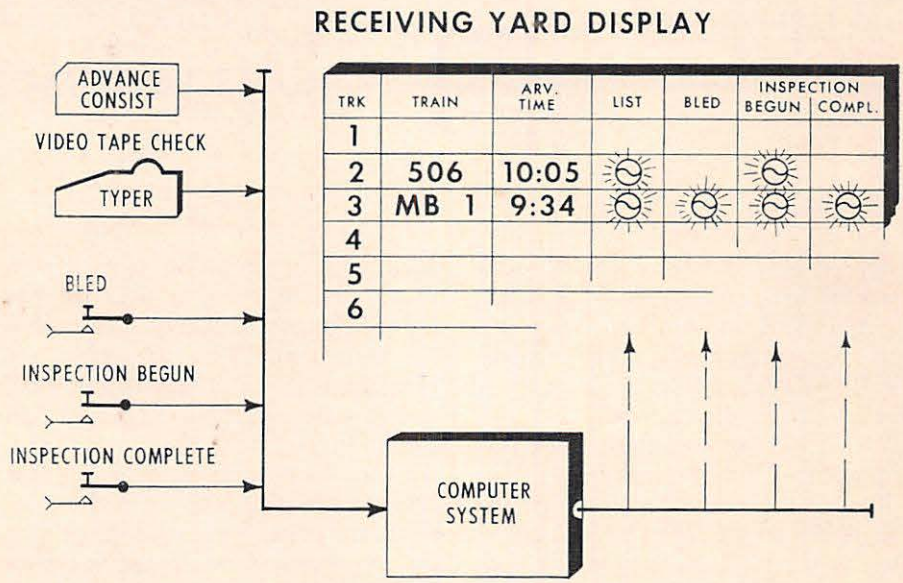


humping, he can command the system to prepare for humping it by simply pushing a correspondingly numbered pushbutton. Other conditions permitting, this will automatically initiate the computer system lining up a route from receiving yard track 3 to the hump. It will indicate on the hump console that the command to hump track 3 has been received.

The power-operated switches in the area between the receiving yard and the lead to the hump are controlled by the computer system for the lining up of through routes. They are "locked" when positioned as result of a call in that mode. They can be individually positioned from the hump console, or on the ground by means of an electrical dual-control feature. When they are locked as result of a through route call, their target lights are caused to flash as a warning to crews on the ground to keep hands off, and stay clear of the route.

Following the hump conductor (or foreman) observing that a command to hump a train has been given, he indicates to the system the number of the hump engine selected to hump the train, by pushing a correspondingly numbered button (Figure 8). When this is done, and the computer system detects that the route to the hump is lined, it will select the frequency assigned to the

7—Receiving yard gets train data

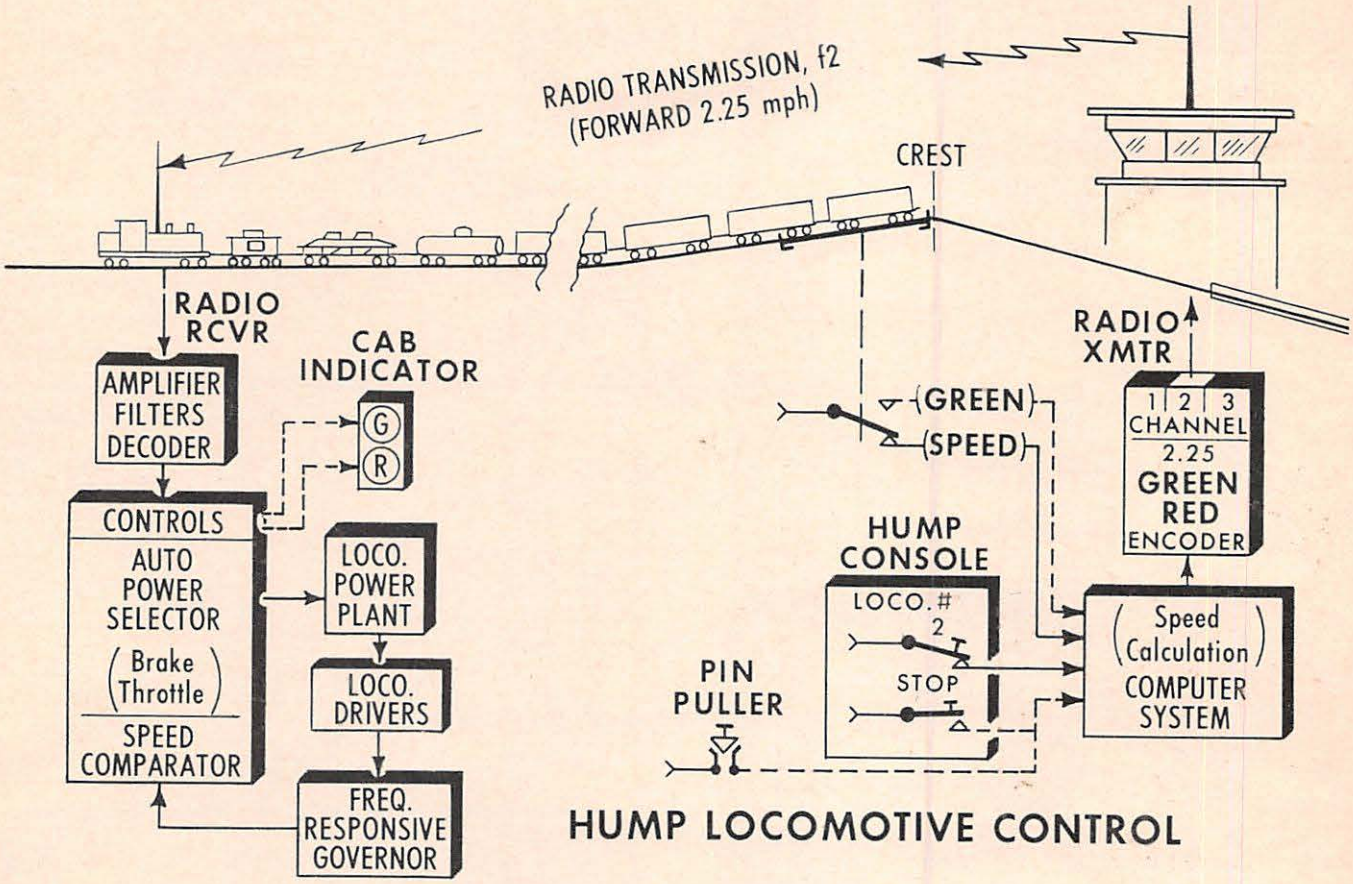


selected hump engine and, via radio, the engine's cab signal will be controlled to display a green signal. When the train's foremost car arrives on the immediate approach to the crest of the hump, the green signal will be taken away.

Immediately, via the radio transmission of a coded digital signal, the hump engine's speed control system will directly, and automatically, control the train's forward speed. This speed will be that which the computer system has calculated as optimum for this train, or major portions thereof as they arrive at the crest. These calculations take into account the average lengths of cars in the order in which they exist, the average number of cars per cut, the distribution of the cuts across the class yard, and the engine's response capabilities—timewise. Calculated speeds can range from 1.5 to 4.0 mph, in 0.25 mph increments. Means are provided on the hump console whereby a stop signal and a back-up signal may be sent to the hump engine, as needed.

The computer system records all of the aforementioned events, and the times of their occurrences. Any

8—Hump conductor has pushbutton controls



stops during humping, and the reason for them, are similarly recorded. When the hump command was given, the computer system automatically printed out, on the high-speed printer, the switch or cut list.

Following completion of the humping of a train, any special handling data, or data for an added car, or other, can be input to the computer system by means of the input–output teletyper. When, or if, there is no more data to be input regarding this train, the end-of-train pushbutton must be pushed. Following this a "corrected" switch list will be printed out. This will show all cars handled, and the class tracks they actually went to. It will flag any misrouted cars and indicate the reason for the misroute, a swing, catchup, cornering protection, switch failure, manual route change, or other. Missing cars are flagged, and reconsignments, diversions, no-bills, hold for orders, and other special data previously input are appropriately indicated.

A train log printout is also produced at this time. It includes the enroute train's identifying data, and the times logged for its arrival, inspection begun and completed, bled, switch list available, command to hump given, route to hump lined, forward signal given, when actual humping began, and when the end-of-train button was pushed. It will list any stops made during humping and the reason, if known: pin puller, power failure, and the like. It will show the hump engine number, the number of cars humped, and the elapsed humping time.

The train log is a tool which enables management to evaluate operation, see where delays occur, and reason for any mishandling.

As the cars go into the class tracks, receiving yard and class yard inventories are automatically updated, as are the group tallies.

The uncoupling, or pulling the pins, is still a manual operation. To minimize uncoupling errors, we provide a computer controlled display, of a size and at a location where it is plainly seen by the pin puller. This display shows the identity of the last car in the next cut to be made. It will reflect any changes that have been input since the switch list was printed. Because of the trouble sometimes encountered in "getting the pin", we have a pin puller retarder. In order that this may be used most advantageously, we provide the pin puller a small, lightweight radio transmitter carried on a belt he wears. With it, and by just a quick touch of a button, he can directly control the pin puller retarder to close or open the instant he finds need for such action. In the same way, he can also command the train to stop.

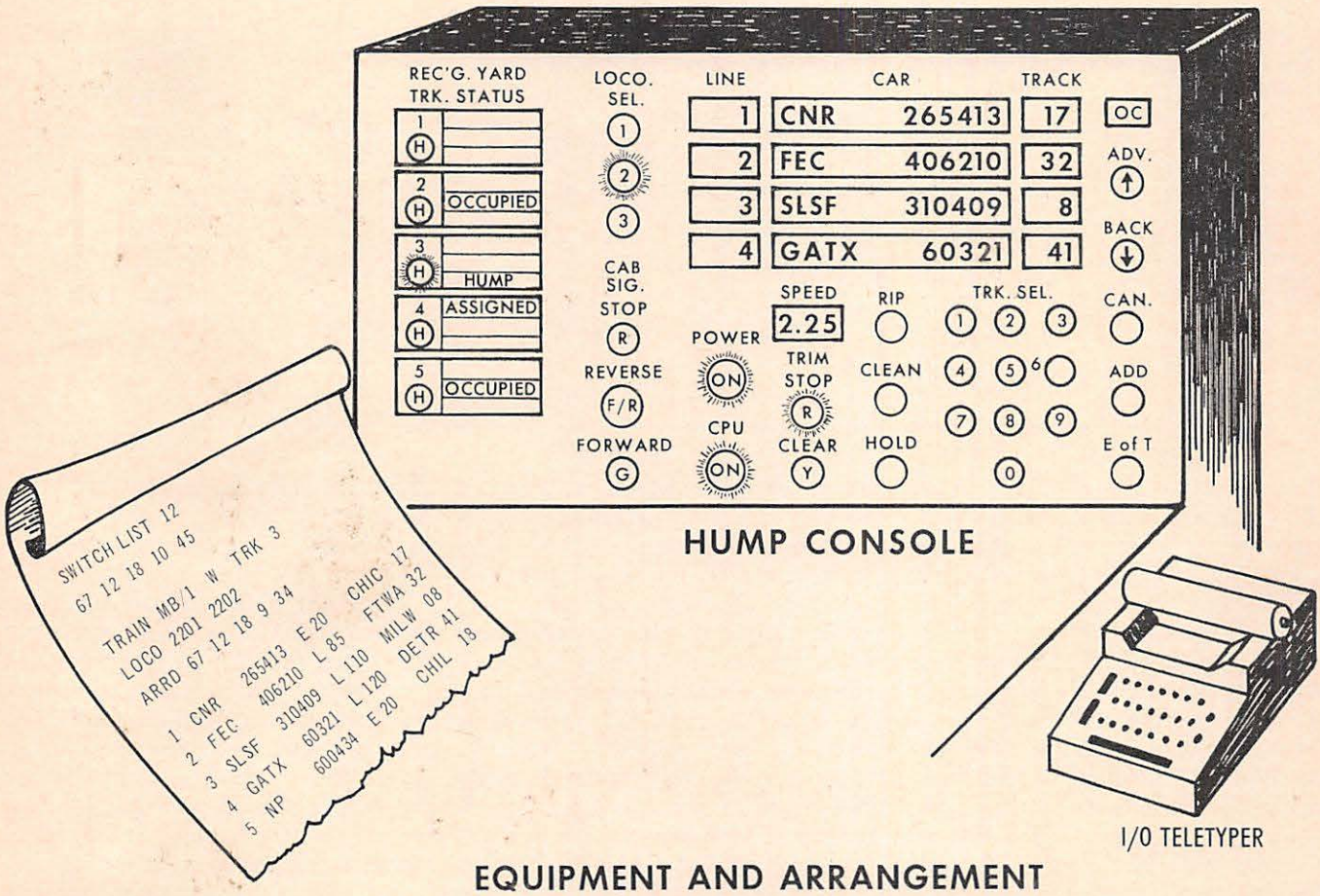
The movement of cuts from the crest of the hump to the class tracks involves two basic functions: routing the cuts, and controlling their speed. The computer system is in command, basing its decisions and outputs on data it has in storage and on inputs it receives from field-ori-

ented subsystems. What is new is the more sophisticated manner in which the computer system enables us to use the information it provides. Too, it reads the switch list directly, no manual inputs are required during normal operation, and it automatically takes appropriate action when certain conditions arise. As an example, it will automatically route cuts to the swing track when the assigned class track becomes full, and it will reroute cuts when the danger of cars cornering becomes apparent. It also keeps a record of where individual cars go, and what their position is on the class track.

The aim at the master, or hump, retarder is to maximize the uniformity of separation between cuts, and to deliver the cuts at the group retarders at an entering speed compatible with the capacity of the group retarders. The function of the group retarder is to deliver cars to the point of coupling on the classification track at an acceptable coupling speed.

The switches and retarders may be manually controlled individually, as needed, such as for making trimming moves, or for maintenance purposes. Manual control overrides au-

Hump console provides visual display of operations



EQUIPMENT AND ARRANGEMENT

SHOWN ONLY ILLUSTRATIVE (VARIED AS REQUIRED)

At the left is the receiving yard track status displays. The train on track 3 is being humped. The locomotive selection display shows that hump engine 2 is working the train, and the speed display indicates that it is presently being controlled at a speed of 2.5 mph. The data display shows that the foremost car, line 1 on the switch list, is just entering the system and will be routed to class track 17. It will be followed by a car going to track 32, and so on. If this display gets out of step with actuality, because of some back up or other special move, it may be brought back into step by means of the advance and backup pushbuttons. If a car is missing, or one is added, appropriate action can be initiated by means of the cancel and add pushbuttons. Cuts can be directed to the rip, clean or hold tracks by means of pushbuttons so labeled. Cuts can be routed to other than their assigned class tracks by means of the track selection digit buttons, 0 through 9.

AUTOMATIC ROUTE CONTROL FACTORS

SOURCE	CONDITION	ACTION
Stored switch list	Car entering	Route to assigned track
Distance-to-Coupling measuring system	Class track full	Route to swing track
ClearanceTrack Circuits	Cars foul	Route to swing track
Switch Control Levers	Switch blocked in wrong position	Route to swing track
Switch repeater relays	Switch Failure	Discontinue further routing of this cut
Manual input	Change of class track	Route to new track
Auto. Weight Scale	Car weighed	Record weight
Wheel and light detectors	Wheel and cut passing	Count and record axles in cut
Track Circuits and Wheel Detectors	Car presence and passage	Issue switch comman at proper times
		Time cut's progress: - calculate cornerin hazard, - detect catchups.
Switch repeater relays, track circuits and wheel detectors	Cut passage	Track cut into class track and record it's arrival, - record if a misrout - update inventories - update group talli

AUTOMATIC SPEED CONTROL FACTORS

SOURCE	CONDITION	ACTION
Stored train data	Train standing time	Assign value and store
	Destination class track	Assign route resist-ance value & store
Wind, Temperature & Moisture Sensors	Ambient conditions	Assign value and store
Weight Detector	Weight selected input for each axle	Calculate cut's weight classification
Cut and Car Detectors (Light & wheel detectors)	Number of cars in cut	
Bulkhead Detector (Light detectors)	Max. height of cut	Calculate wind effect
Automatic Weigh Scale Computer Input System	Actual car weight	Upgrade cut's weight classification
Hump Test Sections (Wheel detectors)	Cut's rolling characteristics	Factor in calculating cut's rolling resistance
		- check cut length
Distance to Coupling Measuring System	Distance cut must penetrate class track	Factor into calculations
Computer System -- with all above factors, calculate desired cut's exit-from-retarder velocity		
Radar	Monitor speed of cut thru retarder	Govern exercise of retarder control to acquire desired cut exit velocity
Entrance, Intermediate and Exit Light Detectors	Presence and passage of cut thru retarder	

tomatic control at all times. When the system is in the automatic mode and manual control is exercised, the event is recorded and shown on the previously mentioned corrected switch list printout.

Now we have classified the cars, and they are on various class tracks. The computer system can tell us where any one of them is, if we wish to inquire. However, in our automated classification terminal, our work is not yet done. We must get the cars out of the class yard and to the departure yard, or to other local destinations as may pertain.

This means work at the bottom end of the yard. We have not yet automated the performance of the required switching moves, so we have switch engines with crews. Once these crews have been given their work orders, they are familiar with the moves they must make, and the switches and crossovers they must use to do the work assigned to them.

A crew centered switching system enables personnel in the crew to select and control the position of switches and crossovers as the need arises. With a small, man-carried control unit, very simple to operate, individual switches can be controlled from on the ground, or when riding on the engine or cars.

This obviates the stopping and waiting for a crewman to walk to a switch and hand-throw it, and then his having to catch onto the engine or cars as they move by. What we propose in the crew centered switching system is not a complex, costly interlocking system—we are just giving the crewman a long arm. He is still responsible for how and when he uses the switches, and for protecting his moves.

The automation of our car record information system has done fine up to now; up to where we have the cars on the class tracks. We should not stop there—and suffer the possibility of losing track of their whereabouts as a result of their being pulled and taken to the departure yard, or shoved onto other tracks as occurs when doubling moves are made. Hence, we suggest a car movement information system, a system employing field equipment which provides the computer system information on the movement of cars over every switch throughout the area where we wish to keep account of car whereabouts.

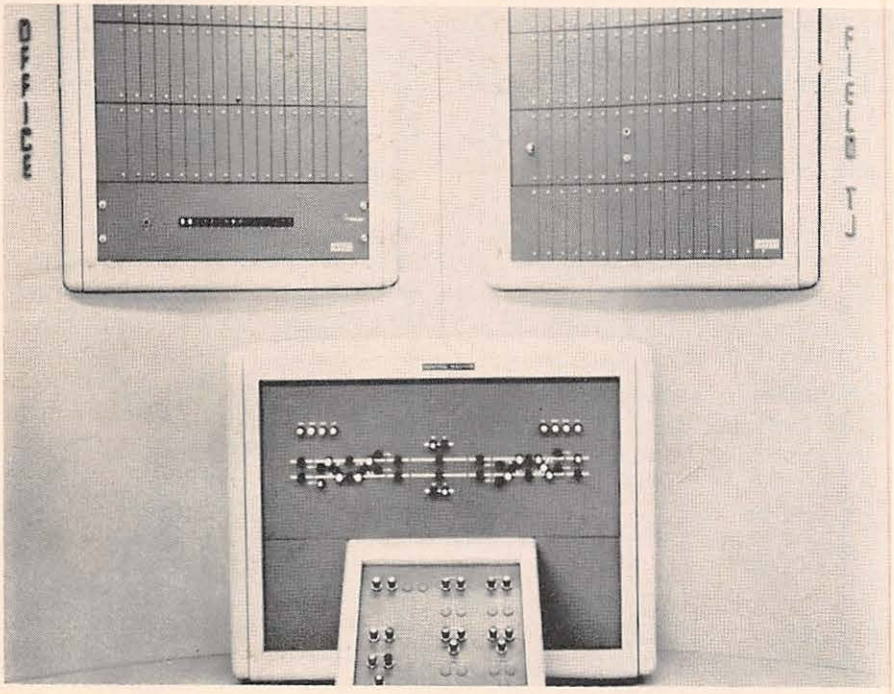
The information provided consists of the direction of car movement, the count of axles passing the point of switch, the direction in which each was moving, and the position of the switch at the time of the event. With the computer system having in storage the identity and location of all cars up to now, it can, with these inputs, and an adequate program, follow the car moves, and add or subtract cars to and from individual track inventories. with the car movement information system extended to the departure yard tracks, the computer system is enabled to build inventories for those tracks.

Now that we are placing blocks of cars that will comprise the consist for an outbound train on an assigned departure yard track, we have still more work to do. The train has to be ordered, a scheduled or estimated time of departure determined, the crew called, the train inspected, the air connected and tested, and the locomotive and caboose placed in it.

The yardmaster, or whoever is directing operations, can input data and commands calling for the required action via his console and teletyper. Such inputs control field oriented displays or printouts local to those who must take the necessary action. When input, the train symbol and departure time, and the action commands: call crew, inspect, and so on, are shown on a departure yard display. This display is generally similar to that provided for the receiving yard. It carries a line for each departure track, the display on which begins when a track is assigned. As field operations are completed, inputs from the field enable the computer system to update the display so that the status of a particular train may be observed by a glance at the display.

When the train departs from the yard, a remote controlled video scanner, or TV camera, scans the train, viewing car initials and numbers, and records the scan on video tape. This is the same as was done when the enroute train was arriving on the receiving yard lead. When the tape is viewed, and the car initials and numbers input to the computer system, it is enabled to associate the individual cars with their respective data it has in storage. In this way, the computer system can output a correct consist for the departing train, listing the cars in the order in which they exist in the train. When automatic car identification is available and used, this operation can be automated. **RS&C**

PRODUCT NEWS



Remote Controls

A new series of solid state and relay models of remote control systems employ the building-block modular design concept. Maintenance time is reduced through the placement of test points on printed circuit boards up front where they are readily accessible. These Servoscan systems are designed to be serviced with a voltmeter, rather than requiring the need of an oscilloscope in trouble shooting. Plug-in cards with integrated circuits are used in the solid state models. Manual stepping circuits are employed to simplify trouble shooting.

Models 2216, 2232 and 2264 are the solid-state systems providing 16, 32 and 64 remote field stations. The relay types are models 2225 and 2250 with 25 and 50 controls and indicators, respectively, at a single station. *Servo Corp. of America. Circle 101 on reader service coupon.*

Battery Box

A new cast aluminum battery box, type 1345, is a pole-mounted unit. It is for use with air-depolarized batteries. *Western Railroad Supply Co. Circle 102 on Reader Service Card.*

• MICROWAVE: The GE TRS-696 microwave system is designed for DC battery operation, but with AC operation available as an option. The system can be used for long-haul transmission of up to 600 telephone channels (SSB-SC) or equivalent. *General Electric Co. Circle 103 on Reader Service Card.*

Railway Signaling & Communications

14 E. Jackson Blvd., Chicago, Ill. 60604
Attn: R. W. McKnight Reader Service Card 1/68

Circle numbers for more information about products and services.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51

101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130

NAME .....
TITLE ..... RAILROAD .....
ADDRESS .....
CITY ..... STATE ..... ZIP # .....

THIS COUPON MUST BE USED ON OR BEFORE MARCH 31, 1968

NEWS BRIEFS

• AMERICAN TELEPHONE & TELEGRAPH CO. is opposing an FCC notice of rulemaking in which the Commission is planning to allocate split channels to mobile radio services in the 450-470 MHz band to provide for sharing of telephone maintenance frequency assignments outside urban areas. AT&T said that telephone maintenance is required in rural areas just as much as in the cities, and that even limited sharing would prohibit future development of systems in rural areas.

• BALTIMORE & OHIO has ordered type J CTC equipment from General Railway Signal Co. for installation on 125 miles of line between Punxsutawney, Pa. and Ashford, N.Y. The CTC machine at Punxsutawney will control 15 remote locations.

• LAND MOBILE RADIO service advisory committee has delivered its 800-page report on frequency congestion to the FCC. No major long-term relief is seen to relieve frequency congestions in the major metropolitan areas. William J. Weisz, vice-president, Motorola Inc., said that "if the public is to continue to receive the benefits, services, and efficiencies provided to it by all areas of the land mobile services, which can only be so provided, additional frequency spectrum must be allocated for this use."

Two areas were identified by the committee as holding promise for limited improvement in frequency utilization. One is the 450 MHz land mobile radio band, in which it is suggested that a reduction in channel spacing be accomplished. Also recommended is a relaxation of the present block allocation system to permit a service suffering frequency channel overcrowding in a given locale to share the frequency channels of another service which is making less intensive use of its channels in that area.

• CITY OF CHICAGO opened bids on Jan. 12 for cab signaling systems and car-carried equipment for the rapid transit extensions in the John F. Kennedy and Dan Ryan expressways. Bids for the No. 1 plan for the wayside cab signal system on a track structure using wood ties were as follows: General Railway Signal Co. bid $3,590,060; Westinghouse Air Brake Co. bid $3,618,203. No. 2 plan using a track structure supported on concrete ties received these bids: General Railway Signal Co.—$3,622,060; Westinghouse Air Brake Co.—$3,660,203. No. 3 plan for the car-carried cab signal equipment obtained three bidders, as follows: Westinghouse Air Brake Co. bid $848,938; General Railway Signal Co. bid $1,143,402; and Westinghouse Electric Corp. bid $1,160,900. The bids will be evaluated by the City and Chicago Transit Authority before a decision is reached as to which companies will be awarded contracts.

• CONSTRUCTION 1968. Several railroads have revealed construction plans for signaling and communications projects in 1968, according to a *Railway Age* survey.

Baltimore & Ohio/Chesapeake & Ohio will spend $1,458,600 to retire second main track and install CTC on the Buffalo division; install hotbox detectors on the Northern Region at a cost of $103,100; and upgrade signal and communications pole line from Grand Rapids to Benton Harbor, Mich., $296,200.

Denver & Rio Grande Western will spend $450,000 to install CTC between Pueblo and Salida, Colo.

Great Northern will install 6 hotbox detectors on its lines; install CTC with four-aspect signaling between Nolan and Casselton, N.D.; add the fourth aspect to signaling now in service between Bainville and Glasgow, Mont.; and install CTC between Sandpoint, Idaho and Troy, Mont.

Illinois Central will spend $3.3 million to install microwave between Chicago and Jackson, Miss. with spurs to Paducah, Ky., and Vicksburg, Miss.; will spend $300,000 to install automatic car identification facilities on its lines; and spend $375,000 to install hotbox detectors at various locations.

Lehigh Valley will spend $300,000 to install CTC and take up 44 miles of second main track between Laceyville and Milan, Pa.; will spend $750,000 to install CTC and take up 48 miles of track between Manchester and Batavia, N.Y.; and will spend $100,000 to install flashing-light signals and automatic short-arm gates at four highway-railroad grade crossings.

Louisville & Nashville will spend $105,000 to install new communications facilities including a dial telephone exchange at Evansville, Ind.; will make an expenditure of another $105,000 for upgrading communications and installing an automatic telephone exchange at E. St. Louis, Ill; and will spend $192,500 for walkie-talkies.

Missouri Pacific will install electric heaters on 36 power switches on three subdivisions; will convert 13.3 miles of ABS to CTC near Fults, Ill.; and will replace 100 radio sets with new transistorized units.

New York Central will spend $200,000 to install 12 hotbox and dragging equipment detectors; will make an expenditure of $106,000 to remotely control Tower C interlocking at Grand Central Terminal; will spend $100,000 to install CTC between Himrods Jct., and Geneva, N.Y.; will spend $138,000 to remotely control Swan Creek interlocking from Toledo, Ohio; and will make an expenditure of $284,000 to install CTC and retire second main track from Porter to Ivanhoe, Ind.

Northern Pacific will spend $244,000 to control an interlocking at Staples, Minn. in an existing CTC system; will spend $101,000 to install CTC from Laurel to Mossmain, Mont.; will spend $110,000 to control a Laurel, Mont., NX interlocking from a CTC control machine at Glendive, Mont.; will make an expenditure of $103,000 to install hotbox detectors between Forsyth and Billings, Mont.; will spend $144,000 to replace 50 semaphore signals with searchlight signals from Helena to Garrison, Mont.; will spend $1,230,000 to install CTC from Castle Rock to Wabash, Wash.; and will make an expenditure of $3,850,000 to install microwave from Billings, Mont., to Seattle, Wash.

Pennsylvania will spend $180,104 to renew signal cable between Newark and Trenton, N.J.; will spend $490,808 to replace two retarders, install presence detectors and three

additional air compressors at Enola, Pa.; will install phase 1 of a retarder renewal project at Morrisville, Pa., costing $503,849; install automatic retarders in Bay View yard at Baltimore, Md., costing $301,835; will spend $156,800 to remote control New Paris, Greenville and West Manchester, Ind., interlockings and convert Hewitt, Ind., interlocking to automatic operation; install hotbox detectors at various locations on the Western Region, costing $284,268; and spend $379,900 to install automatic highway crossing protection equipment at Dayton, Ohio.

Western Pacific will spend $300,000 in continuing a project to install flashing-light signals and automatic short-arm gates at 31 grade crossings in Sacramento, Calif.; and spend $200,000 to install hotbox detectors.

• SECTIONAL MEETINGS of the Communication & Signal Section, AAR, will be held in Cincinnati and St. Louis. The Eastern Sectional meeting will be May 2, 1968 at the Netherland Hilton Hotel, 5th and Race Streets, Cincinnati, Ohio. Chairman will be C. W. Donaldson, communications supervisor, Baltimore & Ohio, and Committee of Direction sponsor will be K. M. Lockerby, system engineer-communications & signals, Pennsylvania. The Western Sectional meeting will be held April 9, 1968 at the Gateway Hotel (formerly Statler-Hilton), 822 Washington Avenue, St. Louis, Mo. Chairman will be O. H. Summers, general superintendent communications & signals, St. Louis-San Francisco, and Committee of Direction sponsor will be J. N. Albertson, general superintendent communications-system, Southern Pacific.

• ERIE LACKAWANNA has purchased 75 Motorola solid-state Motran two-way radios for use in its train communication system.

• ILLINOIS CENTRAL has received approval of DOT's Federal Railroad Administration to install CTC between Madisonville and Dawson Springs, Ky., 15.7 miles, and modify existing CTC between Dawson Springs and Scott Jct., 8 miles.

• INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS has filed section 6 notices on railroads in the United States requesting that the installation and maintenance of automatic car identification (ACI) systems be recognized as work belonging to the IBofEW. A second part of the notice provides that "if and when" any railroad, at a later date, installs the ACI equipment, the work will be recognized as belonging to the electrical workers. An IBofEW representative reported that the notices were filed shortly after the Association of American Railroads announced (Oct. 10, 1967) approval of the Sylvania KarTrak system and recommended implementation. The notices were filed, the IBofEW said, to avoid jurisdictional disputes when future installations are being made.

• LONG ISLAND will be operating 270 new, 100 mph passenger cars, purchased from Budd Co. by the Metropolitan Commuter Transportation Authority. The cars will be equipped with WABCO cab signal equipment. Cab signals will reflect wayside signal indications. However, provision is made for adding four speed commands. Included with this equipment is a speedometer which will show actual train speed and allowable speed ranges in accordance with the received speed command.

• LOUISVILLE & NASHVILLE will purchase 296 chest pack radios for use by yard and road crew trainmen.

• MILWAUKEE ROAD has purchased five IBM video display units used to provide car tracing information for Carscope tracing personnel. The units are tied to the road's IBM 360/30 computer which contains 99,498 car records. Reports are received from 72 yards and 232 interchange points, and are updated hourly by the computer. The IBM 2260 video display unit (similar to a TV screen) has an associated electric typewriter keyboard upon which the operator types the request for car movement information. MILW has ordered three more of these video display units.

• MOBILE RADIO FREQUENCY CONGESTION could be eased by use of UHF TV bands by either sharing or reallocation, stated Federal Communications Commission Chairman Rosel H. Hyde last month at the 1967 Vehicular Communications Conference of the IEEE. He said there are three possibilities being considered by the FCC: (1) utilization of the upper portion of the UHF TV band from 806 to 890 MHz; (2) geographic sharing of UHF TV channels in areas where they are unassigned; and (3) reallocation of the lower four to seven UHF TV channels to the land mobile services.

According to *Telecommunications Reports*, Hyde said: "Reallocation of a few TV channels is to be preferred over other possibilities. In this portion of the band [at the top] aside from translators, there are at present only two TV station assignments. Reallocation in these bands could be accomplished without material disruption of established TV services. On the other hand, we are aware that you view space in this portion of the spectrum as of doubtful value.

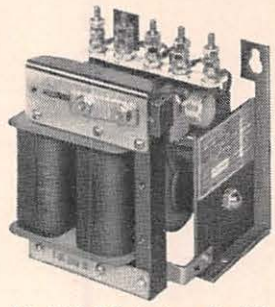
"Unquestionably, the lower end of the UHF TV band would be more desireable for land mobile operations at this time. We have many precedents for believing that advancements in technology, improvements in equipment, improved systems, and the economies of mass production can eventually overcome the problems of higher frequencies. In any event, relief from this source must be regarded as in the long-range area."

• NORTHERN PACIFIC has placed a $408,000 order with Stromberg-Carlson Corp. for motor-switch, 4-wire switching systems to be installed at St. Paul, Minn., Billings, Glendive and Missoula, Mont., Spokane and Seattle, Wash. The new system is a trunk tandem-switching system employing register senders and is suitable for voice and data transmission. The system switches calls on a no-loss basic between PBX trunk, carrier, microwave or physical circuits. The equipment furnished will permit switching of approximately 450 4-wire circuits over NP microwave. The common control equipment allows complete universal numbering from any point on the system on a six-digit basis.

• BAY AREA RAPID TRANSIT DISTRICT in San Francisco has awarded a nearly half-million dollar contract to General Railway Signal

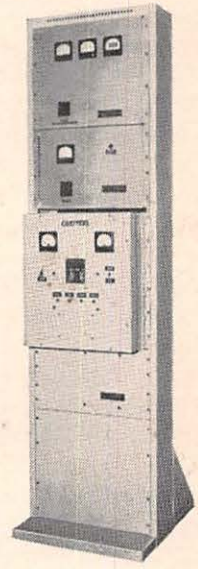
(Please turn to page 35)

WHEREVER YOU NEED DEPENDABLE POWER ...YOU NEED FANSTEEL

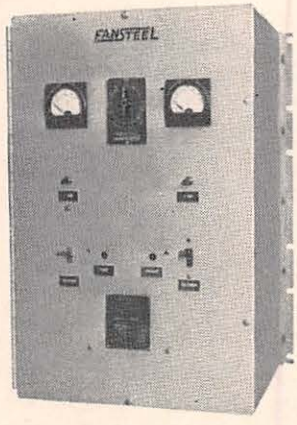


Model DT Selenium Rectifier

Model DL
Automatic Battery Charger



Static SCR Inverter shown in Standby Power System



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Battery Charger

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Fansteel's complete line of rectifier products—ranging from track rectifiers to sophisticated standby power systems—assures you of dependable railway signal and communications system operation under all conditions. You can select from more than 1000 service proved units. All meet existing AAR standards and give you longer operating life, more reliable performance and lower maintenance costs. These include: ■ Constant Potential Battery Chargers—completely automatic units designed especially for unattended operation. ■ Model DL Automatic Battery Chargers—ideally suited for railway signal operations where load and temperature conditions are irregular. ■ Model DT Selenium Rectifiers—the original selenium rectifier for signal service. ■ Static SCR Inverters—which assure emergency AC standby power for communications and signaling systems. Also DC to DC converters. And, Fansteel offers immediate delivery of most signal rectifiers and battery chargers. You'll be ahead to add Fansteel reliability to your system. For detailed facts on any of these units, write today.

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METALLURGICAL CORPORATION
RECTIFIER PRODUCTS DIVISION
NUMBER ONE TANTALUM PLACE
NORTH CHICAGO, ILLINOIS 60064

Circle 14 on reader service card

(Continued from page 33)

Co. to supply 244 model 55 electric switch machines.

• SANTA FE has established a new information systems department, headed by **Flory Mauriocourt,** vice-president information systems. He was formerly vice-president and general auditor. The new department will coordinate all data processing functions and related information services. In addition to computers now in service at Topeka and Chicago, AT&SF will install computers at Wichita, Kan., Fort Worth and Amarillo, Tex., and Los Angeles, Calif. These major cities as well as other key points on the Santa Fe are linked by a 2,450-mile microwave system.

• TEXAS & PACIFIC will shortly begin work on a $5.5 million project to convert 36-track Lancaster yard at Fort Worth, Texas to a 44-track, automatic classification yard. The project will take three years and be done under traffic. During this year, eight additional tracks will be constructed and grades revised in part of the present yard. In 1969, a new hump will be built, extensive grade revisions made, installing of retarders, switches, an automatic scale and other electronic equipment, construct a control tower and rebuild classification tracks. In 1970, new lighting communications and signal facilities will be added and remaining grade revisions to the yard tracks will be made to complete the project. The completed yard will have pushbutton automatic switching and automatic retarder control.

• TRANSISTOR IS 20. On Dec. 23, 1947, Bell Telephone Laboratory scientists John Bardeen, Walter Brattain and William Shockley showed that a small piece of the element germanium could be made to amplify a speech signal about 40 times. Later, in 1956, the trio was given the Nobel Prize for discovery of the transistor effect.

Railroad Personnel

• CHESAPEAKE & OHIO/BALTIMORE & OHIO: **Theodore L. Carlson,** general superintendent communications & signals, has retired. Mr. Carlson was born in Litchfield, Minn. on Dec. 16, 1902. After education at Carleton College, he joined the Great Northern in 1923 as a signal construction worker. Subsequently he was promoted to signalman, and by 1928 was a signal draftsman. He then went with the Norfolk & Western as a signal draftsman, and in 1929 joined the C&O as a circuit designer. He advanced through various positions including that of signal inspector and circuit engineer, and held the position of signal engineer from 1948 to 1951, at which time he was appointed assistant superintendent of signals. In 1961, Mr. Carlson was promoted to general superintendent, communications and signals. Subsequently he was given the added responsibility over B&O signals and communications following C&O control of that railroad.

C. G. McCrary
Missouri Pacific

William B. Van Lear
Norfolk & Western

Neill S. Lewis
Norfolk & Western

Joseph V. Henretta
Norfolk & Western

• DETROIT, TOLEDO & IRONTON: **A. B. Swartzwelder,** engineer communications & signals, Pennsylvania, at Pittsburgh, Pa., has been appointed superintendent communications & signals, with headquarters at Dearborn, Mich., succeeding **W. G. Clinton,** who has retired.

• ILLINOIS CENTRAL **Paul B. Burley,** assistant director of communications, has retired. Mr. Burley was born in Chicago, Ill. on May 28, 1898. He graduated from the University of Illinois with a bachelor of science degree in electrical engineering in 1921. Upon graduation, he joined IC on its Chicago terminal electrification project, and by 1926 he was supervisor of electrical maintenance. He was appointed an assistant engineer, telegraph and signals in 1931, and in 1944 made electronics engineer. From 1946 to 1950, Mr. Burley served as assistant superintendent communication. In 1950, he was promoted to superintendent communication and electrical engineer. In 1967, he was appointed assistant director of communications.

Theodore L. Carlson
C&O/B&O

Paul B. Burley
Illinois Central

• LOUISVILLE & NASHVILLE: **F. G. Garrett,** office engineer, has been promoted to assistant to engineer signals, system, with headquarters at Louisville, Ky.

• MISSOURI PACIFIC: **C. G. McCrary,** recently appointed traffic control engineer, was born in Cisco, Texas on Jan. 8, 1928. He joined the T&P in 1947 as a signal helper, and was later appointed assistant signalman, and was promoted to signalman in 1952. Two years later, Mr. McCrary was appointed signal draftsman. In 1962, he transferred to the MP and was appointed circuit designer. He held this position until November 1, 1967 when he was promoted to traffic control engineer.

• NORFOLK & WESTERN: **William B. Van Lear,** recently appointed manager signals and communications (RS&C Dec. 1967, page 45) was born on May 1, 1916 in Roanoke, Va. He graduated from Augusta Military Academy in 1934, and two years later joined the N&W as

(Please turn to page 36)

(Continued from page 35)

a laborer. He advanced to the position of signalman by 1940, and in 1945 was promoted to signal foreman. One year later, Mr. Van Lear was appointed assistant signal supervisor, and in 1948 he was appointed inspector telegraph and signals. In 1953, he was promoted to assistant to superintendent signals, and four years later appointed assistant superintendent signals. Mr. Van Lear was promoted to assistant manager signals & communications in 1964. On Dec. 1, 1967, he was appointed manager signals & communications.

Neill S. Lewis, engineer signals & communications, was born in Chipley, Fla., on Dec. 5, 1903. In 1924, he joined the Southern as a signal helper. He advanced through various positions including signal maintainer, leading signalman and construction supervisor, holding this position in 1945. Two years later, he joined the Virginian as assistant to superintendent telegraph & signals. In 1952, he was appointed assistant superintendent telegraph and signals, and in 1955 promoted to superintendent telegraph & signals. In 1959, Mr. Lewis was appointed assistant superintendent signals, N&W, following merger of VGN into the N&W. In 1964, he was appointed regional engineer signals & communications at Roanoke, Va., and on Dec. 1, 1967 promoted to his present position.

Joseph V. Henretta, recently appointed regional engineer signals & communications, was born April 13, 1913 in Roanoke, Va. He joined the N&W in 1934 as a laborer and subsequently became signal helper, then signalman in 1938. He advanced to leading signalman and was later appointed signal foreman in 1943. Two years later he was promoted to signal inspector and became general inspector signals in 1957. In April 1967, Mr. Henretta was appointed assistant regional engineer signals & communications at Roanoke. He was appointed to his present position on Dec. 1, 1967.

Carl J. Talley, appointed assistant to manager signals & communications, on Dec. 1, 1967, was born in Elwood, Ind., on Oct. 24, 1929. He joined the Nickel Plate Road in 1947 as a signal helper. He subsequently rose to signalman and signal maintainer (1955) including two years in the U.S. Army Signal Corps (1951-1953). In 1961, he was appointed a signal draftsman, and three years later was transferred in the same position to the N&W. In 1965, he was promoted to assistant general signal inspector, and a year later appointed assistant supervisor signals & communications. In April 1967, Mr. Talley was promoted to assistant engineer signals & communications, the position he held prior to his most recent appointment.

Arthur Gear, Jr., assistant engineer signals & communications, with headquarters at Roanoke, Va., was born on July 15, 1926 at Montmorenci, Ind. He joined the Nickel Plate Road in 1946 as a signal helper and subsequently rose through the positions of signalman, signal maintainer and leading signalman. Mr. Gear was promoted to signal foreman in 1959, and three years later appointed signal designer. In 1965, he was promoted to assistant supervisor signals & communications, N&W, the position he held prior to his Dec. 1967 promotion.

• NORTHERN PACIFIC: **F. Lynn Steinbright,** vice-president operations, has been appointed vice-president executive department with headquarters at Seattle, Wash. Mr. Steinbright had been superintendent of communications from 1941 to 1953, inclusive.

• ROCK ISLAND: **J. W. Youngblood** was appointed supervisor communications installation & maintenance at Kansas City, effective Nov. 1, 1967.

• SEABOARD COAST LINE: **S. J. Davis, Jr.,** signal construction engineer (RS&C Nov. 1967 page 55) was born in Wilmington, N.C. on May 21, 1907. He joined the ACL as a clerk in 1922. Later he became a signal helper and was appointed signalman in 1929. In 1938, Mr. Davis was made chief signalman and three years later appointed signal construction foreman. In 1945, he was promoted to supervisor signal construction. Following merger with the SAL, Mr. Davis was appointed signal construction engineer on July 1, 1967.

L. M. McLean, senior communication engineer, was born in Maxton, S.C. on Dec. 30, 1905. He joined ACL in 1925 as a telephone lineman, and a year later was appointed telephone maintainer. He was promoted to assistant telephone supervisor in 1943 and a year later appointed telephone supervisor. In 1952, Mr. McLean was promoted to communication inspector, and in 1963 he was appointed general supervisor communications & signaling. On July, 1 1967, he was appointed communication engineer, and promoted to his present position on Sept. 16, 1967.

L. J. Mears, communications & signals shop supervisor, was born in Adams Run, S.C. on Sept. 18, 1906. He joined ACL as a laborer in 1925 and subsequently rose through the positions of signalman, assistant maintainer, and became chief signalman in 1938. Three years later he was appointed signal shop supervisor. On July 1, 1967, he was promoted to his present position.

N. A. Peebles, electronic engineer,

Carl J. Talley
Norfolk & Western

Arthur Gear, Jr.
Norfolk & Western

S. J. Davis, Jr.
Seaboard Coast Line

L. M. McLean
Seaboard Coast Line

L. J. Mears
Seaboard Coast Line

N. A. Peebles
Seaboard Coast Line

was born on July 16, 1909 at Fayetteville, N.C. He joined ACL in 1927 as a stenographer and subsequently became a rate clerk and later a clerk. Following completion of a radio engineering course from a technical school, Mr. Peebles was appointed electronic engineer in 1945. Following merger of ACL and SAL, he was appointed electronic engineer of the SCL.

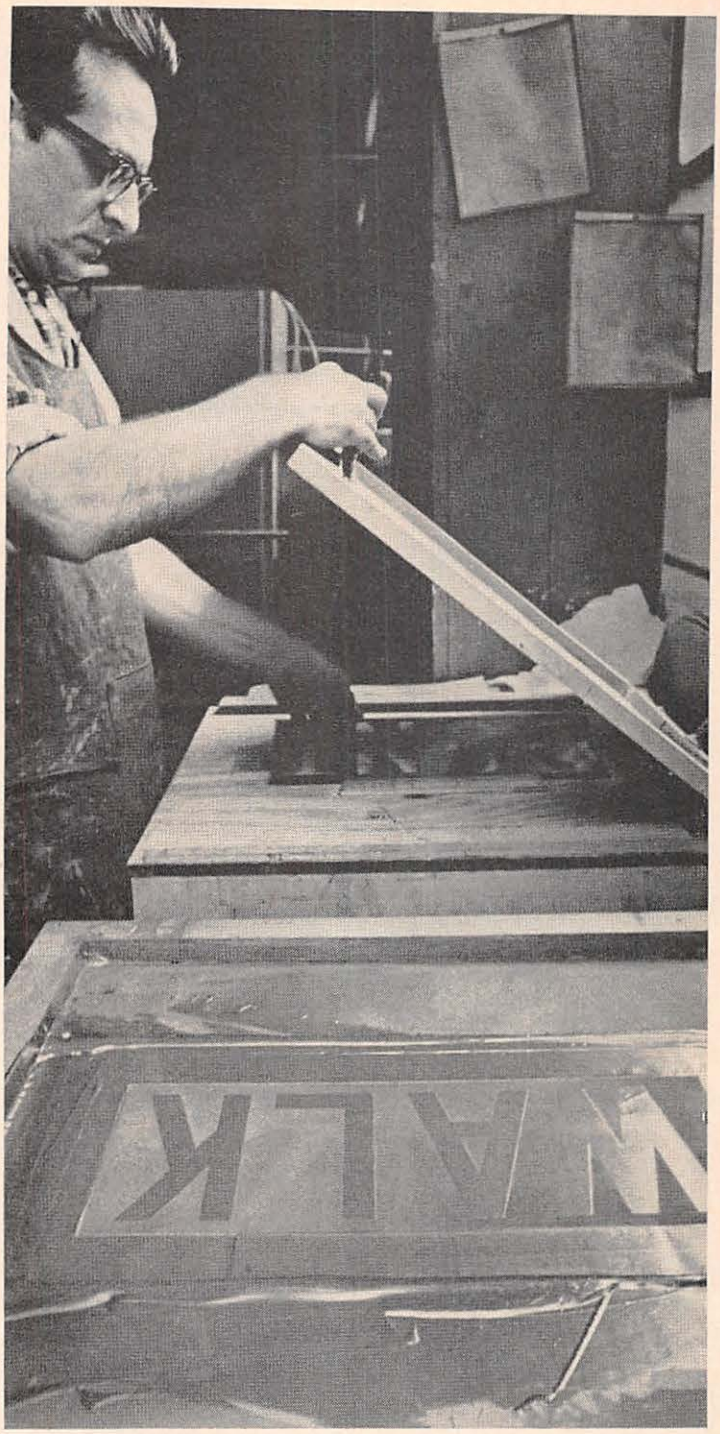
R. M. Rosensteel, signal engineer, was born in Pittsburgh, Pa. on July 25, 1904. He began his signal career as an assistant signalman for Union Switch & Signal Co. in 1926 working on various construction projects. He was promoted to field engineer in 1929, and in 1935 was appointed circuit draftsman. He joined the Union Railroad in 1937 as a signalman, and later was promoted to signal foreman. In 1942, Mr. Rosensteel joined Western Maryland as signal & telephone inspector, and three years later promoted to assistant engineer. He joined ACL in 1947 as a circuit engineer, becoming assistant engineer six years later, and was appointed signal engineer in 1963. On July 1, 1967 he was promoted to his present position.

Supply Trade News

• ABEX CORP.: **Robert N. Post,** district sales manager, Denver, for the Railroad Products Group, has been appointed product manager for railroad trackwork, succeeding **Joseph P. Kleinkort,** who has retired. **Kenneth D. Hughes,** sales representative in New York, has been appointed assistant to product manager for railroad trackwork, with headquarters at Mahwah, N.J., where the trackwork engineering department has recently moved to from Chicago. **Charles E. Godfrey,** sales representative at Chicago, has been promoted to district sales manager at Denver, replacing Mr. Post.

Mr. Post joined Abex in 1951 as a sales representative in New York and was transferred to Denver in 1962 where he was named district sales manager. Mr. Hughes joined the company in 1945 and has served in manufacturing and sales capacities. Mr. Godfrey joined Abex in 1939, and has been assistant chief engineer for trackwork, assistant product manager for trackwork and a sales representative in Chicago.

(Please turn to page 39)



Screening for safety . . . The silk screen process applies a ceramic enamel to Kopp Glass pedestrian traffic signal lenses. Like many of our products, these lenses must be hand screened and finished. And, to assure a lasting, clear legend, the glass formula must be compatible with the enamel that is fused to it. In making molded industrial glass, the skilled hands of many people serve you at Kopp.

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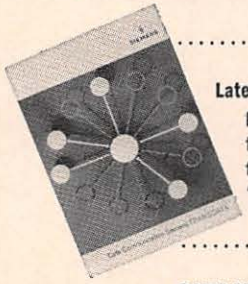
The Teleprinter 100 is used by railroads, utility and pipeline companies, plants, department stores, many other organizations, to transmit and receive data on internal communications networks. It is compatible with all systems—over 100,000 are now in use in over 100 countries.

Up to 13 characters per second. 5 level code. Transmits to one unit, several or all units in system. Low noise level. Makes up to 12 carbons. Sends in red, receives in black, or vice versa. Receive-only units available. Tape reader and tape punch attachments. Many special features.



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at every main-track turnout

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Hayes Derail—the most universally used track device. Designed and built by men whose only business is railroads.

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Hayes Track Appliance Co.

RICHMOND, INDIANA 47374

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Write to our office nearest you for complete information.

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Railway Signaling & Communications
Railway Age
Railway Purchases & Stores
Railway Track & Structures
Railway Locomotives & Cars

(See complete list of offices on contents page)

Circle 17 on reader service card

(Continued from page 37)

• BUCKEYE TELEPHONE & SUPPLY CO. will serve as distributors of Port-O-Matic emergency oxygen equipment made by Erie Mfg. Co., and eye and face guards made by Sellstrom Mfg. Co.

• CABLE COMMUNICATION SYSTEMS INC. has been formed by Simplex Wire & Cable Co. and Compagnie Industrielle des Telecommunications, a subsidiary of Compagnie Generale d'Electricite, Paris, France. The new company will provide a single source for engineering, furnishing and installing private land and submarine communication systems employing coaxial cable and electronic transmission equipment.

• COPPERWELD STEEL CO.: **Charles A. Taylor,** president and chief executive officer, has been elected chairman of the board of directors succeeding **James M. Darbaker,** retired. Mr. Darbaker will continue as a director and a member of the executive committee. **Phillip H. Smith,** senior vice-president and a director, was elected to succeed Mr. Taylor.

R. M. Rosensteel
Seaboard Cost Line

Kenneth D. Hughes
Abex Corp

Robert N. Post
Abex Corp

Robert R. Vehe
Kleinschmidt-SCM

• THOMAS A. EDISON INDUSTRIES, Primary Battery Division: **Einar V. Steffensen,** director of engineering, has retired after 31 years of service. A native of Denmark, he received a bachelor of science degree in chemical engineering from the Royal Technical College of Copenhagen. He joined Edison in 1936 and from 1958 to 1966, he served as chief engineer for the Primary Battery Division. In 1966, he was promoted to director of engineering.

• KLEINSCHMIDT DIVISION OF SCM CORP.: **Robert R. Vehe,** director of marketing, has been appointed vice-president of marketing. **Donald J. Stefanik,** director of engineering was named vice-president of engineering. Mr. Vehe, who holds a bachelor of science degree in mechanical engineering from Northwestern University, joined Kleinschmidt in 1950 in the production department. Subsequently, he was named sales-service manager, then contract administration manager,

(Please turn to page 40)

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and to director of marketing in 1963. Mr. Stefanik, who holds a bachelor of science degree in electrical engineering from Villanova University, joined Kleinschmidt in 1954 in the engineering department, and subsequently rose through the positions of test engineer, project engineer and project manager. In 1966, he was appointed director of engineering.

• LYNCH COMMUNICATION SYSTEMS INC.: **J. Robert Gibbens,** a member of the technical staff of Bell Telephone Laboratories, Inc., in Holmdel, N.J., has been appointed assistant chief engineer. He will be responsible for coordination of production, application engineering, systems engineering and for the supervision of signaling systems development. Mr. Gibbens received his BSEE degree from Arizona State University in 1961 and his MSEE degree in 1963 from New York University.

Samuel T. Huey, project engineer, has been appointed assistant chief engineer, and will be responsible for non-linear systems including pulse code modulation and data transmission equipment. He has been with Lynch for 7 years as a project engineer, and prior to that has been associated with RCA in Canada and Marconi Research in England. He has a BS degree in physics and a post graduate certificate in radio engineering from Queens University in Belfast, Ireland.

• MOORE ASSOCIATES: **Rex L. Elmore** has been appointed sales manager. He was formerly district sales manager at Houston, Texas for Engineering & Plastic Sales Co. He is an Ohio University graduate in industrial technology.

Frank L. Irvin
Preformed Line Prod

Max A. Lekson
Preformed Line Prod

Richard A. Mather
Western RR Supply

James A. Van Horn
Western RR Supply

• PREFORMED LINE PRODUCTS CO.: **Frank L. Irvin,** assistant general manager of sales, has been appointed general manager of sales. **Max A. Lekson,** manager of special industries sales has been appointed manager of sales, general industries.

• SYLVANIA ELECTRIC PRODUCTS INC.: **Ellis E. Walker, Jr.,** has been appointed railroad sales engineer in the Commercial Electronics Division, manufacturer of KarTrak ACI systems. A native of Augusta, Me., Mr. Walker has a bachelor's degree in mechanical engineering and master's degree in business administration from Northeastern University in Boston. He joined Sylvania in 1963 and has held positions in transportation systems planning, administration and sales. Prior to joining Sylvania, he served with the Boston & Maine.

• WESTERN RAILROAD SUPPLY CO.: **Richard A. Mather,** assistant to chief engineer, signals & communications division, has been appointed chief engineer, succeeding **James A. Van Horn,** who has retired, but will continue as a consultant with the division.

Mr. Van Horn was born in Philadelphia, Pa. in September 1902, and was graduated from Villanova College in 1925 with a BS degree in electrical engineering. He started with Union Switch & Signal in 1922 and was employed in the engineering department until 1944 when he was appointed a sales engineer in the Pittsburgh district office. In 1951, he was appointed assistant district manager, and four years later promoted to district manager. Later he was appointed assistant to the vice-president railway sales, and manager of sales analysis. He joined WRRS in 1961 as chief engineer, signals & communications division.

Mr. Mather was born on Nov. 6, 1935 in Des Moines, Iowa. After education at Chicago Technical College, he joined the Milwaukee Road as a signal helper. He advanced through various positions including that of signal maintainer and signal draftsman. He joined the Belt Railway of Chicago in 1961 as an assistant engineer, signals and electrical. In 1966, he joined WRRS as assistant to chief engineer, signals & communications division.

• XEROX CORP.: **Raymond A. Hay,** manager of planning for the business products and systems division, has been appointed general manager of the information systems division.

Donald J. Stefanik
Kleinschmidt-SCM

J. Robert Gibbens
Lynch Comm. Sys

Samuel T. Huey
Lynch Comm. Sys

Rex L. Elmore
Moore Associates

Obituaries

• VERNON O. COON, a sales and service representative of Vapor Corp., died last month.

• R. E. GREEN, retired assistant signal-electrical engineer, New York Central at Detroit, Mich., died in November 1967 after a short illness.

• W. HUNTER RUSSELL, assistant to general manager, sales, Poor & Company, died Jan. 1 in Evanston, Ill.

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If you haven't checked into the savings possible with today's Alumoweld® Type M® guy strand, you're in for a pleasant surprise.

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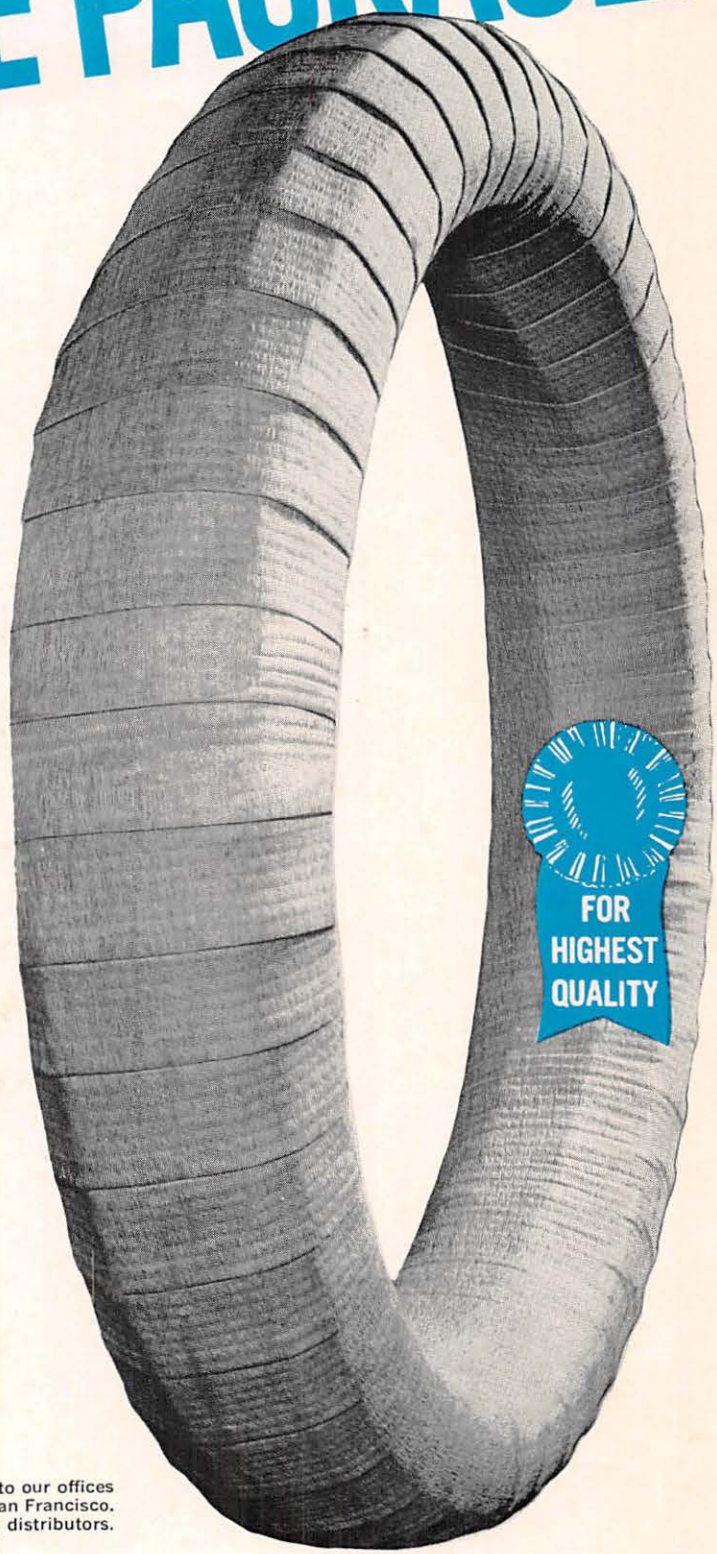

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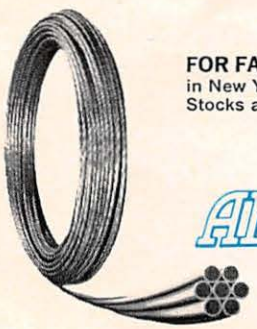

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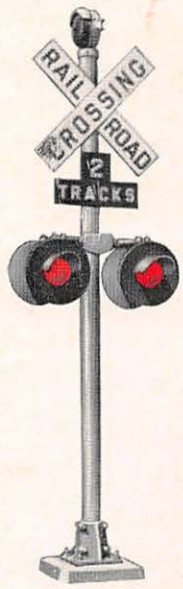

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Formulated of acrylic and molded in one piece, Western's Plastic crossing signal Roundels and switch lamp Lenses maintain constant color and transmission values. They meet AAR Requirements.

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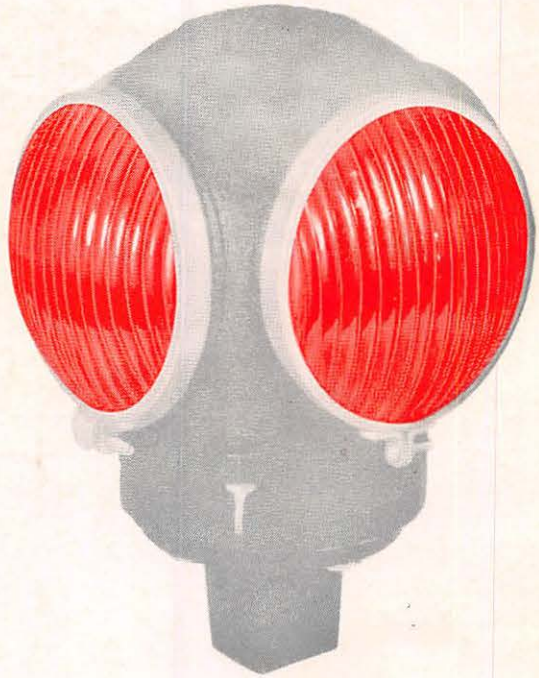

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